North Carolina Department of Transportation
Statewide Planning Branch
Small Urban Unit

Thoroughfare Plan Technical Report for

The Town of Pink Hill

March 1999

Town of Pink Hill
Thoroughfare Plan

Prepared by the:

Statewide Planning Branch
Division of Highways
North Carolina Department of Transportation

In cooperation with:

The Town of Pink Hill
The Federal Highway Administration
U.S. Department of Transportation

March, 1999

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Small Urban Planning Unit Head

Acknowledgments

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Chapter 1
Introduction

Thoroughfare Plan Development and Responsibility

This report documents the findings of a study by the North Carolina Department of Transportation (NCDOT) to update the 1992 Pink Hill Thoroughfare Plan. This study was initiated in September of 1997, in response to a request from local officials to consider the effects of traffic generated from the Global Transpark over a thirty-year planning period. The study culminated in the mutual adoption of an updated thoroughfare plan. The geographic location of Pink Hill is shown in Figure 1 and the Pink Hill Thoroughfare Plan is given in Figure 2, dated November 10, 1998.

Thoroughfare planning enables a transportation system to be progressively developed to adequately meet the transportation needs of a community, as land development and traffic volumes increase. Planning for future transportation needs prevents unnecessary costs and impacts to the physical, social, and economic environment. Thoroughfare plan studies are conducted based on the principles outlined in Appendix A.

The purpose of this study is to reexamine the present and future transportation needs of the Pink Hill area in order to develop a revised thoroughfare plan. The recommendations proposed herein are based on existing roadway conditions and projected growth for the urban area over a thirty-year planning period. Since actual growth rates and patterns may differ from those anticipated, it may become necessary to accelerate or retard the implementation of recommendations or to revise the proposals. It is therefore desirable to have the thoroughfare plan updated regularly in order to revise growth projections and amend the thoroughfare plan, as necessary. Further, a more detailed analysis will be conducted prior to construction of any project, to determine the specific location and design requirements.

The town of Pink Hill and the NCDOT share responsibility for the proposed thoroughfare improvements. The mutually adopted Pink Hill Thoroughfare Plan serves as a guide for providing a coordinated, adequate, and economical major street system. For the planning efforts to be effective, the town and the state must procure in advance or protect, by various legal means, the right of way needed for future roadway improvements. Local officials and citizens are also responsible for initiating the implementation of improvements. Since transportation needs throughout the state exceed available funding, local areas should aggressively pursue funding for desired projects.

Summary of Recommendations

The major recommendations of the 1998 Pink Hill Thoroughfare Plan are summarized below. Projects included in the 1998-2004 Transportation Improvement Program (TIP) are shown in parentheses. The Pink Hill Thoroughfare Plan is shown in Figure 2 and the Recommended Improvements are shown in Figure 3.

NC 11 (R-2001)

Widen roadway to multi-lanes with a bypass of Deep Run
From NC 11 north of Pink Hill to Jacksons Store

NC 11-903 (R-2204)

Widen roadway to four lanes with a bypass of Pink Hill on new location
From NC 24 at Kenansville to NC 11 north of Pink Hill

Widening to provide 12-ft lanes

SR 1103 (Potter's Hill Road) - from SR 1105 (Pleasant Hill Road) to Pink Hill eastern town limits

SR 1111 (Old Pink Hill Road) - from NC 11 to SR 1163 (Duplin County Road)

SR 1546 (Bill Sutton Road) - from SR 1547 (Grady Smith Road) to SR 1550 (Lester Turner Road)/ SR 1108 (Anderson Road)

SR 1704 (Kitty Noecker Road) - from SR 1705 (Tapp Farm Road) to western planning boundary

SR 1705 (Tapp Farm Road) - from SR 1704 (Kitty Noecker Road) to southern planning boundary

Recommended Intersection Improvements

Intersection of SR 1103 (Broadway Street) and Pine Street - restrict parking in the vicinity of the intersection to increase the sight distance

GEOGRAPHIC LOCATION FOR PINK HILL NORTH CAROLINA

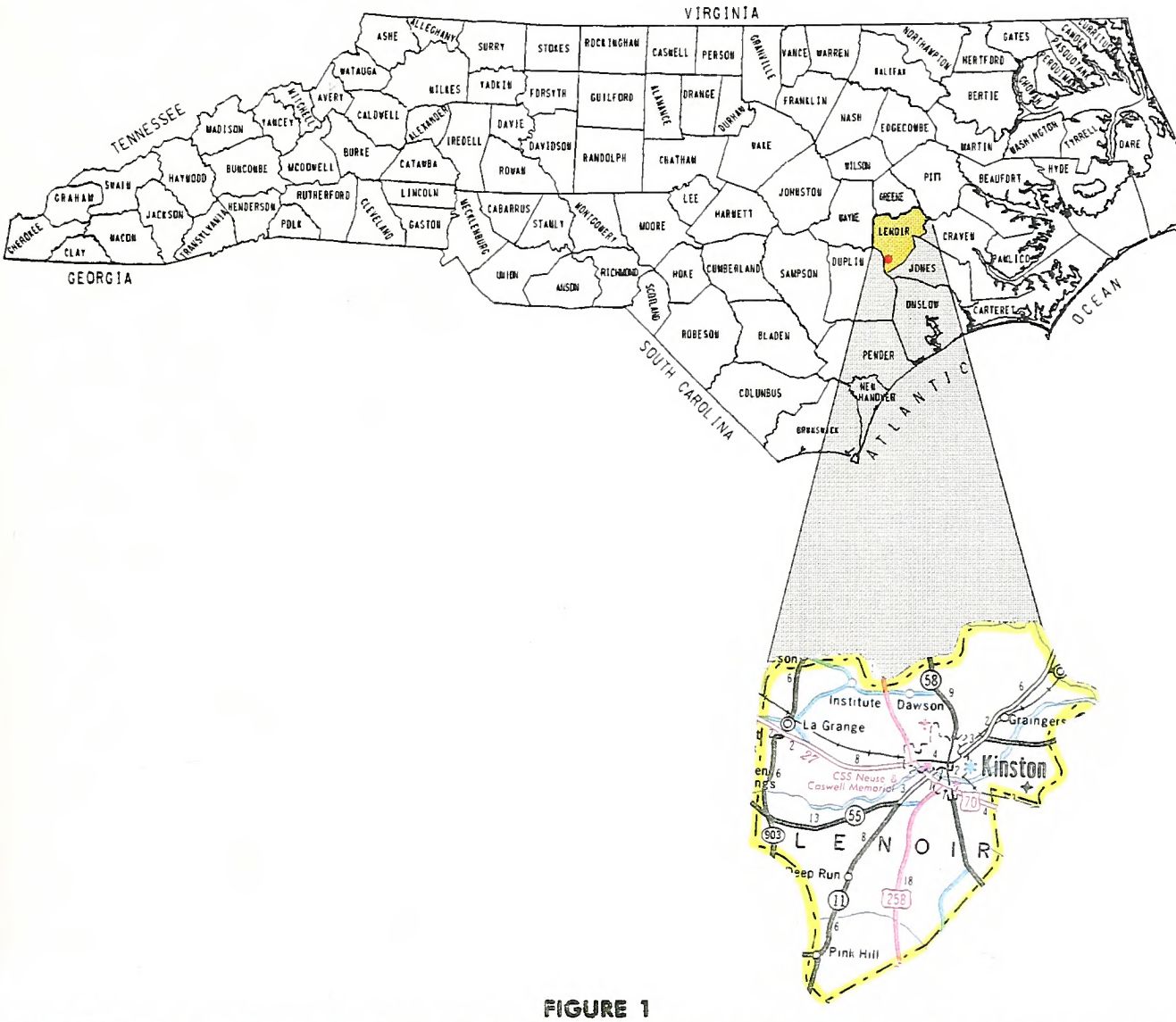
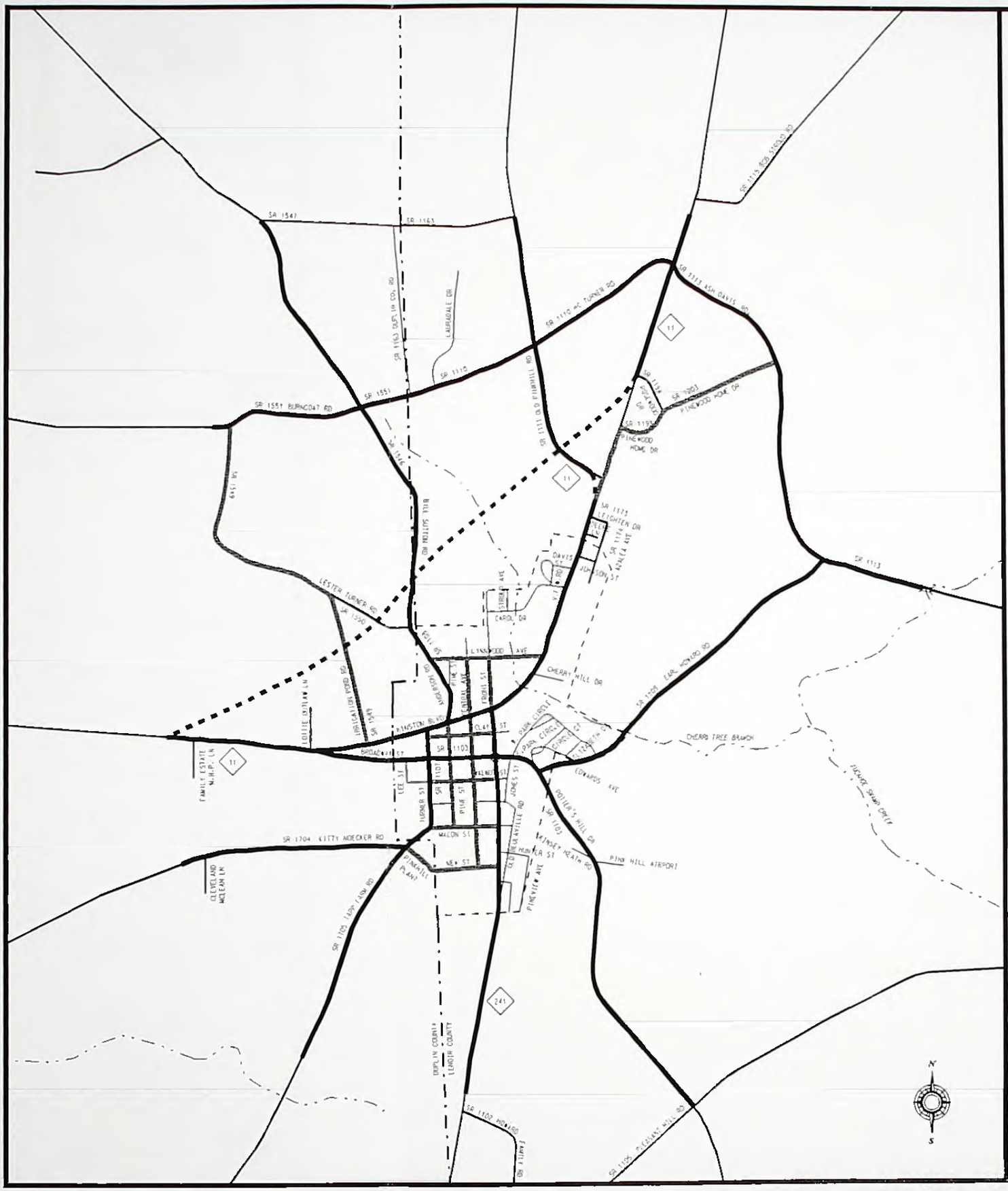


FIGURE 1



PINK HILL
THOROUGHFARE PLAN

NOVEMBER 10, 199B

LEGEND

	EXISTING	PROPOSED
MAJOR THOROUGHFARE	———	- - -
MINOR THOROUGHFARE	———	- - -

ADOPTED BY:

TOWN OF PINKHILL	12-14-98
PUBLIC HEARING	12-14-98
RECOMMENDED BY STATEWIDE PLANNING	12-15-98
N.C. DEPARTMENT OF TRANSPORTATION	1-08-99

FIGURE 2

PINK HILL
NORTH CAROLINA

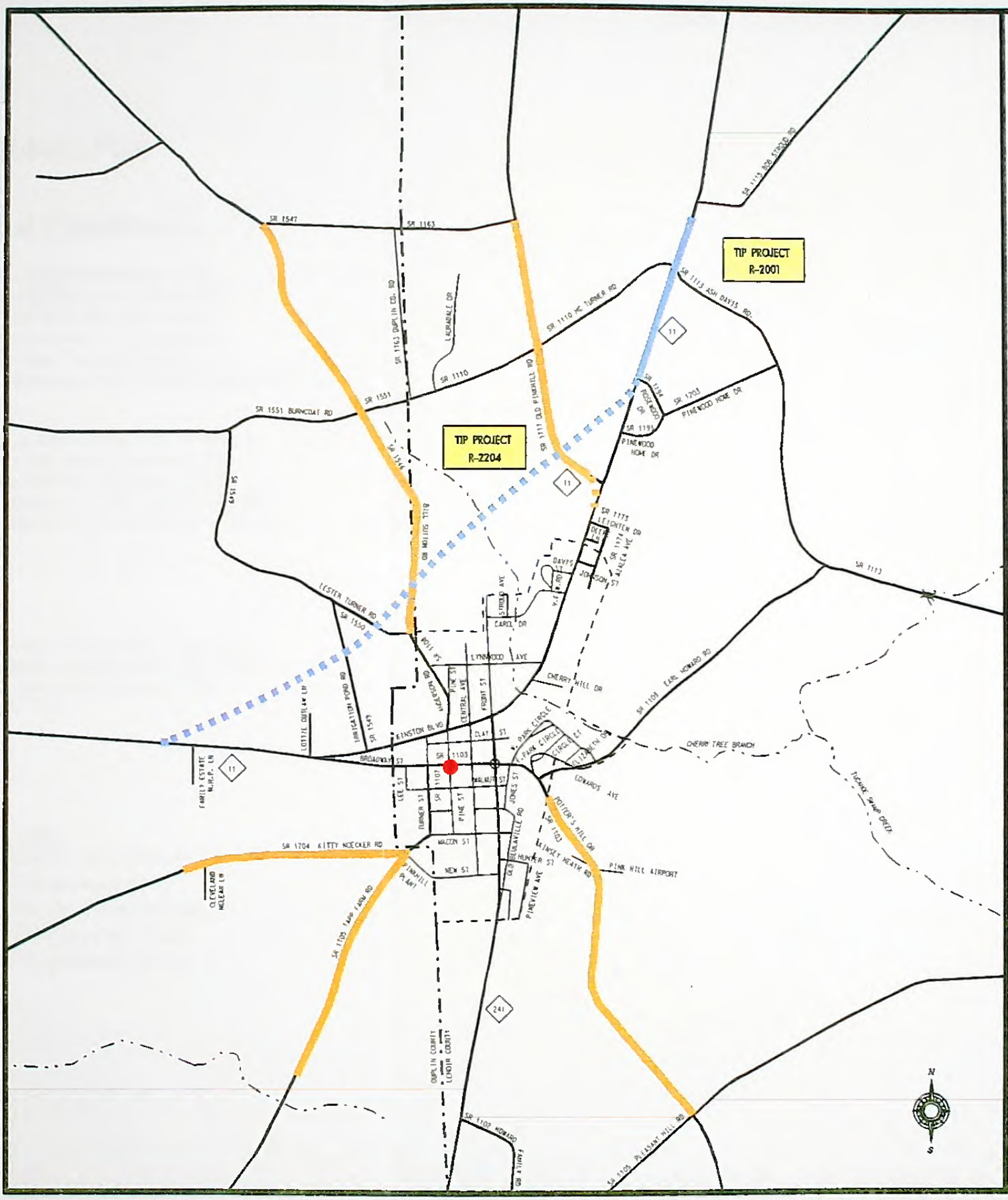
PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH

IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

SCALES

0 600 1200 1800 2400 3000
feet

0 200 400 600 800 1000
meters



RECOMMENDED IMPROVEMENTS

NOVEMBER 10, 1998

LEGEND

WIDENING — NEW LOCATION

4-LANE DIVIDED FACILITY

24-FOOT FACILITY

TIP PROJECTS — TIP PROJECT R-0000

NON-CONSTRUCTION RECOMMENDATION

FIGURE 3

PINK HILL
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH

IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

SCALES

0 600 1200 1800 2400 3000
feet

0 200 400 600 800 1000
meters

Chapter 2
Recommended Thoroughfare Plan

Thoroughfare Plan Goals and Functional Classification

The goal of thoroughfare planning is to propose a transportation system that will serve the anticipated future transportation needs of the local area. A thoroughfare plan study identifies existing and future deficiencies in a transportation system in order to uncover the need for improvements and new facilities. Thoroughfare planning methods enable various roadway configurations to be evaluated for their efficiency in serving the area. Recommendations are proposed to reduce traffic congestion and improve safety by eliminating both existing and projected deficiencies in the transportation system.

In addition to proposals for future transportation improvements, a thoroughfare plan provides a representation of the highway system by functional use. Specifically, the thoroughfare plan designates major and minor thoroughfares and includes any new facilities proposed. A full description of thoroughfare classification systems is given in Appendix A. The major and minor thoroughfares for the Pink Hill planning area are listed below and are depicted in Figure 2, the Pink Hill Thoroughfare Plan.

Major Thoroughfares

Major thoroughfares are designed to provide for the expeditious movement of high volumes of traffic within and through urban areas. This system of thoroughfares includes interstates, other freeways, expressways, and parkways, as well as major streets. Listed below are the major thoroughfares, as designated in the 1998 Pink Hill Thoroughfare Plan.

* NC 11 (Kinston Boulevard)
* Proposed NC 11 Bypass
* NC 241 (Front Street)

Lenoir County

* SR 1103 (Potter's Hill Road/ Broadway Street)
* SR 1107 (Turner Street)
* SR 1108 (Anderson Road/ Pine Street)
* SR 1109 (Earl Howard Road)
* SR 1110 (H.C. Turner Road)
* SR 1111 (Old Pink Hill)
* SR 1113 (Ash Davis Road)

Duplin County

* SR 1546 (Bill Sutton Road)
* SR 1551 (Burncoat Road)
* SR 1704 (Kitty Noecker Road)
* SR 1705 (Tapp Farm Road)
* SR 1706 (Broadway Street)

Minor Thoroughfares

Minor thoroughfares function as collectors for traffic from local access streets to major thoroughfares. Minor thoroughfares supplement the major thoroughfare system by facilitating minor through traffic movements and by providing access to abutting property. The minor thoroughfares in the Pink Hill planning area are listed below.

* SR 1193/ 1203 (Pinewood Home Drive)
* SR 1549 (Irrigation Pond Road)
* SR 1738 (Pink Hill Plant Road)
* Central Avenue
* Clay Street
* Front Street (north of NC 11)
* Lynnwood Avenue
* Macon Street
* New Street
* Pine Street (south of NC 11)
* Walnut Street

Thoroughfare Plan Recommendations

The process of developing and evaluating thoroughfare plan recommendations involves many considerations, including the goals and objectives of the area, identified roadway deficiencies, environmental impacts, existing and anticipated land development, and travel services. Detailed data about the existing street system and travel characteristics is collected, including traffic counts, population, housing, employment, and other information. Thoroughfare planning involves using this data to analyze the existing street system and projecting it over the thirty-year planning period to estimate future traffic conditions. After existing and future deficiencies are identified, proposed recommendations are analyzed to determine their effectiveness in improving traffic conditions. Documentation of the analysis involved in developing the recommendations for Pink Hill is given in Chapter 4 and Appendix B. Refer to Figure 3 for depiction of the recommendations.

Proposed Major Improvements and New Facilities

The major improvements and new facilities proposed in the 1998 Pink Hill Thoroughfare Plan are summarized below. Projects included in the 1998-2004 Transportation Improvement Program (TIP) are shown in parenthesis.

- **NC 11 (R-2001 and R-2204)**
  Improvements to NC 11 are scheduled in the 1998 - 2004 Transportation Improvement Program (TIP) as Projects R-2001 and R-2204. Project R-2001 includes the widening of NC 11 to multi-lanes, with a bypass of Deep Run. The project limits are from NC 11, north of Pink Hill, to Jacksons Store. Project R-2204 involves widening NC 11-903 to four lanes, with a bypass of Pink Hill on new location. The project limits for the entire project are from NC 24 at Kenansville to NC 11 north of Pink Hill. The environmental analysis for both of these projects

has been completed and portions of these projects are at various stages in the design and construction phases. For more detailed information on the current status of these projects, the NCDOT Division Office can be contacted.

For more specific contact information for the division office or any other NCDOT personnel, contact the Customer Service Office by calling toll free 1-877-DOT-4YOU or visit the NCDOT website at www.dot.state.nc.us. The office address for Division Two, which includes Lenoir County, is given below.

Division Two Engineer's Office
N.C. Department of Transportation
P.O. Box 1587
Greenville, NC 27835

Widening Projects

The following roadway sections are recommended to be widened to improve safety and increase capacity. Each of the roadway sections currently has lane widths less than 12 feet and, based on the volume of traffic on the road, are recommended to be widened. Refer to Appendix C 'Thoroughfare Plan Tabulation' and Appendix D 'Typical Thoroughfare Cross Sections' for more detailed information on these recommended widening projects. Before any roadway improvements are made, especially to roads that are part of a bike route system, the NCDOT Division of Bicycle and Pedestrian Transportation should be consulted on the most appropriate cross section.

- **SR 1103 (Potter's Hill Road):** It is recommended that SR 1103 be widened from two 9-foot lanes to two 12-foot lanes from SR 1105 (Pleasant Hill Road) to Pink Hill eastern town limits.
- **SR 1111 (Old Pink Hill Road):** It is recommended that SR 1111 be widened from two 10-foot lanes to two 12-foot lanes from NC 11 to SR 1163 (Duplin County Road).
- **SR 1546 (Bill Sutton Road):** It is recommended that SR 1546 be widened from two 10-foot lanes to two 12-foot lanes from SR 1547 (Grady Smith Road) to SR 1550 (Lester Turner Road)/ SR 1108 (Anderson Road).
- **SR 1704 (Kitty Noecker Road):** It is recommended that SR 1704 be widened from two 9-foot lanes to two 12-foot lanes from SR 1705 (Tapp Farm Road) to the western planning boundary or some other logical terminus as determined by the NCDOT Division Office.
- **SR 1705 (Tapp Farm Road):** It is recommended that SR 1705 be widened from two 9-foot lanes to two 12-foot lanes from SR 1704 (Kitty Noecker Road) to the southern planning boundary or some other logical terminus.

Intersection Improvements

- **Intersection of SR 1103 (Broadway Street) and Pine Street:** It is recommended that parking be restricted in the vicinity of the intersection to increase the sight distance. This improvement is being coordinated through the NCDOT Division Office.

Bicycle Routes

In the Pink Hill planning area there are no highways designated as statewide bicycle routes by the NCDOT Division of Bicycle and Pedestrian Transportation. However, Lenoir County's bicycle routes 43 (Connector Spoke) and 45 (Tractor Spoke), which are concurrent in the Pink Hill planning area, are designated along SR 1111 (Old Pink Hill Road) and NC 11. (For more information on these routes, refer to the map "Bicycling Lenoir County Style", available through NCDOT's Division of Bicycle and Pedestrian Transportation). These designated bicycle routes may be subjected to more bicycle traffic than other roadways of similar design. Due to the shared, or multi-modal, use of these facilities, it is recommended that substandard sections be widened to a standard cross section suitable for bicycle traffic, as funding permits. These improvements will enhance the safety and operation of the facility.

Before roadways designated as bicycle routes are widened, the NCDOT Division of Bicycle and Pedestrian Transportation should be consulted. This division can recommend the most appropriate cross section for the widening, in addition to providing assistance in identifying the need for improvements based on present and future bicycle traffic. For further consideration and assistance, the coordinator of this division can be contacted at the address below.

NC Department of Transportation
Division of Bicycle and Pedestrian Transportation
P.O. Box 25201
Raleigh, NC 27611

Public Involvement

Based on a request from the town of Pink Hill on May 20, 1997, a study to update the thoroughfare plan for Pink Hill was officially started in September of 1997. NCDOT officials met with the Pink Hill Town Commissioners on October 7, 1997, to present information on the thoroughfare planning process and to gather input on the transportation needs of the town. On September 8, 1998, NCDOT representatives and Pink Hill Town Commissioners met to develop socioeconomic data projections to be used to estimate traffic conditions over the thirty-year planning period. NCDOT and Pink Hill officials met again on November 10, 1998, to develop recommendations for the thoroughfare plan. On December 1, 1998, a public drop-in session was held, where information on the proposed thoroughfare plan was distributed and NCDOT representatives were available to discuss the recommendations.

The proposed thoroughfare plan was presented at the December 14, 1998, Pink Hill Town Commissioners' Meeting, with members of the public present. After a public hearing, the Town Commissioners adopted the 1998 Pink Hill Thoroughfare Plan. The thoroughfare plan was adopted by the North Carolina Board of Transportation on January 8, 1999.

Chapter 3
Implementation of the Thoroughfare Plan

Once the thoroughfare plan has been developed and adopted, implementation is one of the most important aspects of transportation planning. Unless implementation is an integral part of this process, the effort and expense associated with developing the thoroughfare plan will be lost. There are several tools available for use by the municipality to assist in the implementation of the thoroughfare plan. This chapter provides a description of various methods of implementation and funding sources available for the major project proposals of the Pink Hill Thoroughfare Plan.

State-Municipal Adoption of the Thoroughfare Plan

The town of Pink Hill and the North Carolina Department of Transportation (NCDOT) have mutually approved the thoroughfare plan shown in Figure 2. As provided in North Carolina General Statue 136-66.2, the mutually adopted thoroughfare plan serves as the basis for future streets and highway improvements in and around the municipality. Also, as a part of these General Statutes, it is required that the municipality and the NCDOT reach agreement on responsibilities for existing and proposed roadways included in the thoroughfare plan. Further, the adoption of the thoroughfare plan by the municipality enables standard road regulations and land use controls to be used effectively in the implementation of this plan, as briefly described below.

Methods of Protecting Thoroughfare Plan Corridors

Subdivision Regulations

Subdivision regulations can require that plans for any proposed subdivision be submitted to town officials for approval. Approval may be contingent on the subdivision being constructed to meet certain standards. Through this approval process, it is possible to require subdivision streets to conform to the thoroughfare plan and to reserve or protect necessary right of way for proposed roadway improvements or new facilities. Also, requiring subdivision streets to be constructed to adequate standards reduces maintenance costs and simplifies the transfer of streets to the State Highway System. Appendix E outlines recommended subdivision design standards pertaining to road construction.

Zoning Ordinances

Zoning ordinances can be beneficial to thoroughfare planning by designating appropriate locations of various land uses and establishing allowable densities for residential development. One benefit of encouraging stability in development patterns is enabling future traffic projections to be made for transportation planning.

Among the benefits of effective zoning ordinances is the establishment of development standards. The use of development standards can aid traffic operations on major thoroughfares by minimizing

the type of strip commercial development that creates traffic problems, including increased traffic accident potential.

Development Reviews

Any request for driveway access to a state-maintained road is reviewed by a NCDOT District Office and/or the Traffic Engineering Branch. In addition, any development expected to generate large volumes of traffic (e.g., shopping centers, fast food restaurants, or large industries) should be comprehensively studied by the NCDOT Traffic Engineering Branch, Project Development and Environmental Analysis Branch, and/or Roadway Design Unit. When development proposals are reviewed at an early stage, it is often possible to significantly improve the development's accessibility while preserving the integrity of the thoroughfare plan. Since the municipality is usually the first contact for the developer, it is important for municipal officials to advise developers of this review requirement.

Future Street Line Ordinances

A municipality with legislative approval may amend its charter to be empowered to adopt future street line ordinances. This ordinance, enacted for selected streets, is particularly beneficial for planned future improvements, such as roadway widening. Through a metes-and-bounds description of a street's future right of way requirements, the municipality may prohibit new construction or reconstruction of structures within the future right of way. This approach requires specific design hearings to be held as an opportunity for affected property owners to obtain information about what to expect and to make necessary adjustments without undue hardship.

Roadway Corridor Official Maps

A Roadway Corridor Official Map (Official Map) is a document adopted by the North Carolina Board of Transportation which allows the reservation of roadway corridors as provided by General Statutes 136-44.5 through 136-44.53. Official Maps place temporary restrictions on private property rights by prohibiting the issuance of a building permit or the approval of a subdivision on property within an adopted alignment, for up to a three-year period beginning when a request for development is denied. The Official Map in effect serves as notice to developers that the state or municipality intends to acquire specific property. This process is a beneficial tool in directing development so that sites can be reserved for public improvements in anticipation of actual need.

Funding Sources

Capital Improvements Program

A municipality's Capital Improvements Program can be used to aid in the implementation of the planned thoroughfare system. A Capital Improvements Program consists of two lists of projects: those to be funded and implemented fully by the municipality and those designated as state responsibility to be funded through the Transportation Improvement Program (TIP). These lists must be constrained by available or anticipated funding over the specified time frame.

Transportation Improvement Program

The Transportation Improvement Program (TIP) is a document that lists all major transportation projects statewide, and their funding sources, planned by the NCDOT for a seven-year period. Every two years the TIP is updated and completed projects are removed, programmed projects are advanced, and new projects are added. In addition to roadway construction and widening, TIP funds are available for bridge replacement, highway safety projects, enhancement projects, environmental mitigation, railroad crossings, bicycle facilities, and public transportation.

During biannual public hearings, municipalities, local citizens groups, and other interested parties may request projects to be included in the TIP. Any group or citizen requesting a particular project(s) should submit to the NCDOT Board of Transportation Member representing their area the following: a letter with a prioritized summary of requested projects, TIP candidate project request forms, and project location maps. Refer to Appendix F for an example of a TIP project request packet. The Board of Transportation reviews all of the project requests from each area of the state. Based on the technical feasibility, need, and available funding, the board decides which projects will be included in the TIP.

County Construction Account

The County Construction Account is used to allocate funding to pave unimproved roads, widen roadways, stabilize dirt roads, make minor alignment improvements, and even construct short connectors when appropriate. These improvements are implemented on a priority basis that is developed through the NCDOT Division Offices. The appropriate Division Office, which is Division 2 for Lenoir County and Division 3 for Duplin County, should be contacted for more information on the County Construction Account.

Small Urban Funds

Small Urban Funds are annual discretionary funds that are distributed to municipalities for qualifying projects. A given municipality may receive funding for multiple projects, but there is a maximum of one million dollars per year per division. Requests for assistance through this fund should be directed to the appropriate Division Office.

Industrial Access Funds

Industrial Access Funds are available for construction of access roads for industries with plans to develop property that does not have access to any state-maintained road, if certain economic conditions are met. For more information on this funding source, the NCDOT Secondary Roads Office should be contacted.

The North Carolina Highway Trust Fund Law

The Highway Trust Fund Law was established in 1989 as a plan with four major goals for North Carolina's roads and highways. These goals are:

1. To complete the remaining 1,716 miles of four lane construction on the 3,600 mile (5,806 km) North Carolina Intrastate System.

2. To construct a multilane connector in Asheville and portions of multilane loops in Charlotte, Durham, Greensboro, Raleigh, Wilmington, and Winston-Salem.

3. To supplement the secondary roads appropriation in order to pave, by 1999, 10,000 miles of unpaved secondary roads carrying 50 or more vehicles per day, and all other unpaved secondary roads by 2006.

4. To supplement the Powell Bill Program.

A portion of this bill which will benefit the Pink Hill planning area over the thirty-year planning period is the paving of most, if not all, of its unpaved roads on the state-maintained system. Inquires regarding the Highway Trust Fund Law should be directed to the NCDOT Program Development Branch.

Implementation of Recommendations

The following summary gives recommendations for the most suitable funding sources and methods of implementation for the major project proposals of the Pink Hill Thoroughfare Plan. For more specific information on the recommendations, refer to Chapter 2.

- **NC 11 (R-2001 and R-2204)**
  The proposed improvements to NC 11, including multi-lane widening and a bypass of Pink Hill, are currently funded in the 1998-2004 Transportation Improvement Program (TIP). The recommended methods of corridor protection, as described in the previous section, should be employed to the fullest extent possible. Specifically, subdivision and development reviews should be conducted to avoid any development in the corridor needed for these improvements.

- **Widening to provide 12-ft lanes**
  For those roadway sections that are proposed to be widened from substandard widths to 12-foot lanes, funding through the county construction account may be requested through the NCDOT Division Office. Until these widening projects are funded and constructed, subdivision regulations and development reviews should be used to avoid encroachment on the right of way needed for these improvements.

Construction Priorities and Cost Estimates

Construction priorities will vary depending on what criteria are considered and what weight is attached to the various criteria. For example, higher priority may be given to improvements to the major thoroughfare system, where benefits are greater, than to minor thoroughfares, with lower traffic volumes. For inclusion in the North Carolina Transportation Improvement Program, a project must show favorable benefits relative to costs and should not be prohibitively disruptive to the environment. For the major project proposals of the Pink Hill Thoroughfare Plan, cost estimates have been developed with respect to user benefits. Additionally, probabilities have been estimated for stimulation of economic development and environmental impact.

Reduced user cost should result from any roadway improvement, from simple widening to construction of a new roadway. Roadway improvements should also relieve congested or unsafe conditions. Comparisons of the existing and the proposed facilities are made in terms of vehicle operating costs, travel time costs, and accident costs. These user benefits are computed as total dollar savings, over the thirty-year design period, using data such as project length, base year and design year traffic volumes, traffic speed, type of facility, and volume to capacity ratio. Refer to Table 2 for the estimated benefits of the major project proposals of the Pink Hill Thoroughfare Plan.

Offsetting the benefits derived from any project is the cost of construction. A new facility, despite high projected benefits, might prove to be unjustified due to excessive right of way and construction costs. Construction costs are estimated by comparison to average statewide construction costs per mile for similar project types. Anticipated right of way costs are based on average property costs per acre in the project area. Table 2 gives the total project costs for the major project proposals of the Pink Hill Thoroughfare Plan.

Roadway improvements have the potential to stimulate economic development in the area by providing access to developable land and by reducing transportation costs. A project's impact on economic development is a subjective estimate based on knowledge of the proposed project, local development characteristics, and land development potential. The probability is rated on a scale from 0 (representing no development potential) to 1.00 (representing excellent development potential).

Analysis of the environmental impact of a project includes consideration of the physical, social/cultural, and economic environment. Listed below are thirteen items considered when evaluating the impacts on the environment.

* air quality
* water resources
* soils and geology
* wildlife
* vegetation
* neighborhoods
* noise
* educational facilities
* churches
* parks and recreational facilities
* historic sites and landmarks
* public health and safety
* aesthetics

Environmental impact analysis also uses a probability rating from 0 (representing no benefit to the environment) to 1.00 (representing a positive impact to the environment.) Negative values are

assigned to probabilities to indicate negative impact. The summation of both positive and negative impact probabilities with respect to these factors provides a measure of the relative environmental impact of a project. Table 1 shows the probability scale used in the analysis. This table can be used as a guideline for interpreting the "Economic Development" and "Environmental Impact" values given in Table 2.

Table 1

Probability Estimation Guide

Subjective Evaluation	Impact Probability
Excellent - very substantial	1.00
Very good - substantial	0.75
Good - considerable	0.50
Fair - some	0.25
Poor - none	0.00

Table 2

Benefits Evaluation for Major Projects[1]

Widening Projects[2]	Benefits (millions)	Cost[3] (millions)	Length mi	Benefits/ mi	Economic Development	Environmental Impact
SR 1103	0.50	0.70	1.12	0.45	0.15	0
SR 1111	0.24	0.56	0.90	0.27	0.15	0
SR 1546	0.44	0.84	1.34	0.33	0.15	0
SR 1704	0.50	0.43	0.68	0.74	0.15	0
SR 1705	0.16	0.45	0.72	0.22	0.15	0

Note: [1]Benefits evaluations for NC 11 Widening and Bypass (Projects R-2001 and R-2204) are not given due to their status as funded projects in the TIP.

[2]The benefits evaluations for these projects are only for those sections, described in Chapter 2, that are in the Pink Hill planning area. The benefits and cost estimates will need to be adjusted if the project limits are revised.

[3]The cost estimate should be considered in light of the fact that these type of widening projects are often combined with scheduled resurfacing projects.

Chapter 4
Development of the Thoroughfare Plan

This chapter documents the analysis conducted in the development of the Pink Hill Thoroughfare Plan. As described below, a travel forecast model has been developed for Pink Hill in order to identify deficiencies and to evaluate proposed improvements. The analysis of the existing roadway system includes determining the capacities and the level of service provided, as well as identifying locations with high accident rates. Also considered are factors affecting the future travel demand on the roadway system, such as population growth, anticipated development trends, and land use patterns. From this analysis, existing and anticipated transportation problems are identified and improvements to eliminate the deficiencies are studied. Also, a preliminary environmental screening is conducted in conjunction with project development to identify appropriate corridors.

Travel Forecast Model Development

A computerized travel forecast model is used in analyzing the local street system to identify existing and anticipated future deficiencies and to evaluate alternate solutions. Detailed information about the local area is used in the model to simulate existing traffic conditions. Future traffic conditions are modeled by projecting the data over some planning period, which is to the year 2025 for this study.

For the purposes of the model, an area to be studied is defined. It is necessary to study an area beyond existing town limits to appropriately analyze traffic patterns and to anticipate municipal growth over the planning period. The planning area is divided into zones of similar land use to facilitate data collection and aggregation. The planning area and zone definition for Pink Hill is shown in Figure 4.

A network of streets is selected to be included in the travel forecast model so that there is enough detail to realistically duplicate existing conditions without hindering the ability to calibrate the model. Generally, all the major thoroughfares and the most significant minor thoroughfares or collector streets are represented. Figure 5 shows the streets in the Pink Hill planning area that composes the street network in the travel forecast model.

In order to simulate the traffic in the area, socioeconomic data is collected for use in the model. Housing counts are used to estimate how many trips are generated and employment data is used to model where trips are attracted. Other data about the existing street system, such as distance and speed, are used to model what routes are taken to travel from given origins to destinations. The travel forecast model is calibrated to traffic counts taken throughout the study area, some of which are by vehicle classification, as shown in Figure 6. Additional data, such as roadway capacities and lane configurations, is included in the model to make it an effective tool in evaluating traffic conditions and project proposals. More detailed information about the development of the travel forecast model for Pink Hill is given in Appendix B.

PLANNING AREA ZONE MAP

LEGEND

CORDON LINE

ZONE LINE

ZONE NUMBER 00

FIGURE 4

PINK HILL
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH

IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
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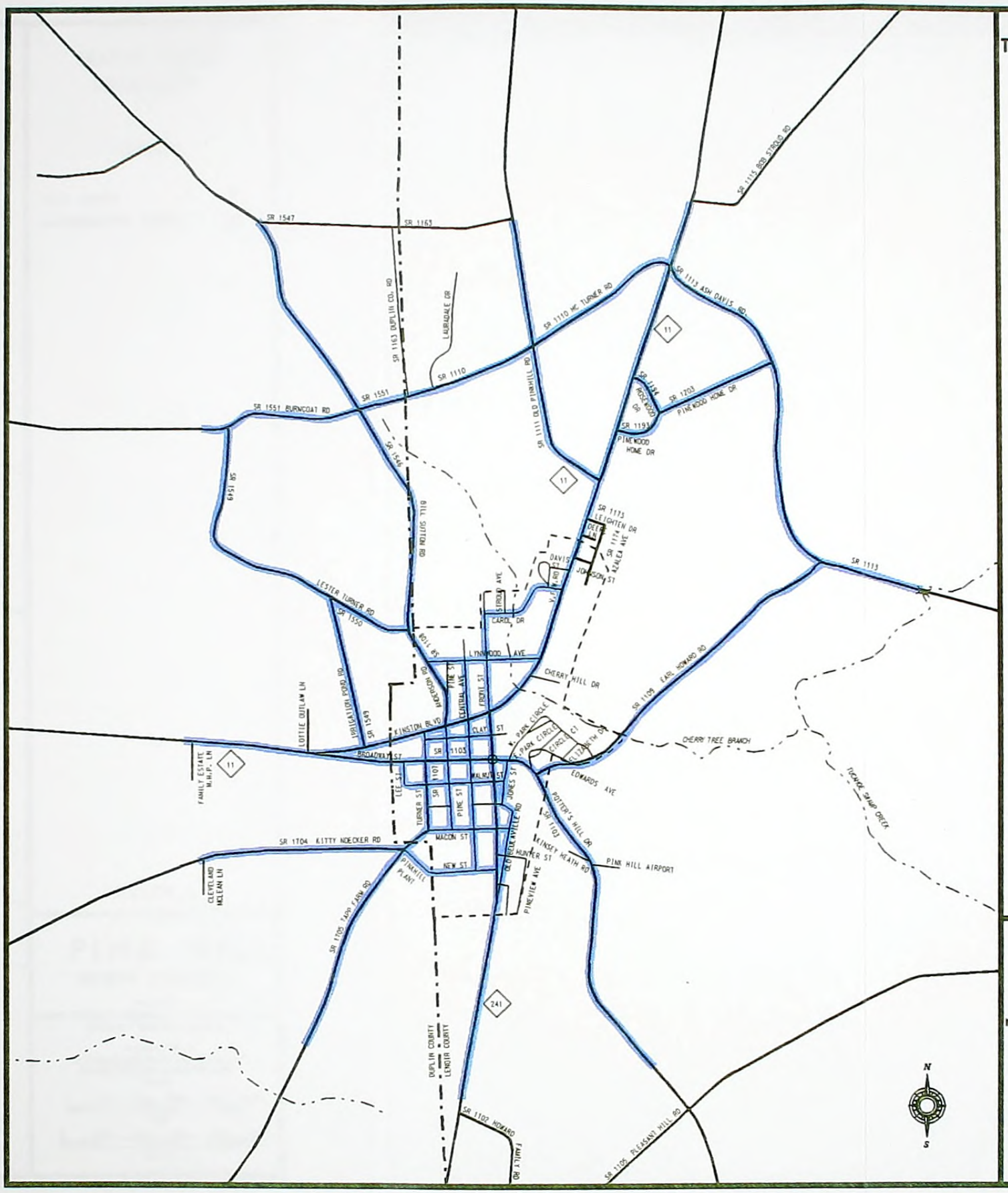

TRAVEL FORECAST MODEL NETWORK

LEGEND

NETWORK LINKS

FIGURE 5

PINK HILL
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH

IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

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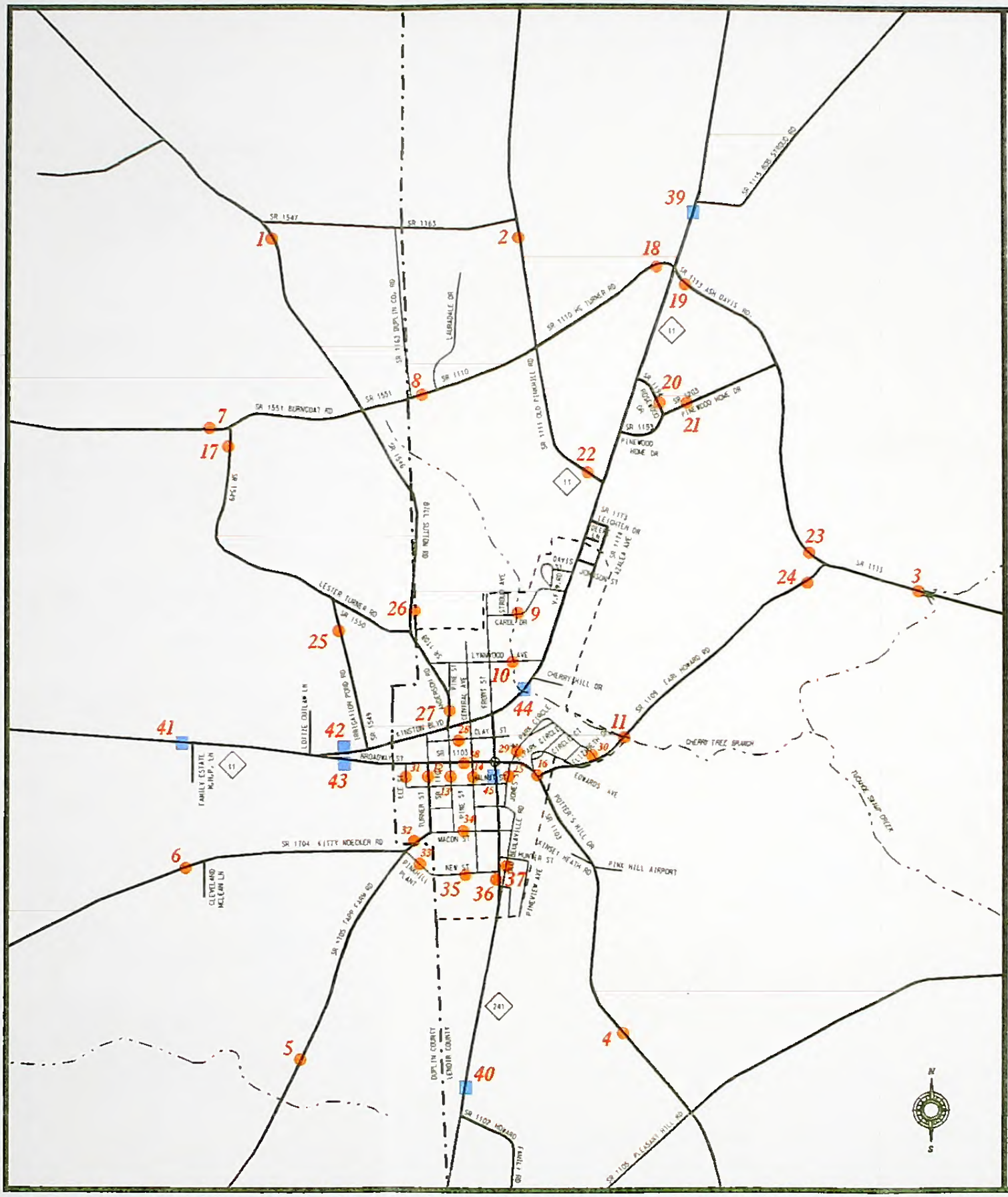
0 200 400 600 800 1000
meters



TRAFFIC COUNT LOCATIONS

LEGEND

DAILY COUNT

CLASSIFICATION COUNT

FIGURE 6

PINK HILL
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH

IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

SCALES

0 600 1200 1800 2400 3000
feet

0 200 400 600 800 1000
meters

Analysis of the Existing Roadway System

In evaluating the ability of the existing street system to serve the area's travel desires, emphasis is placed not only on detecting the deficiencies, but also on understanding their cause. Travel deficiencies may be localized and the result of substandard highway design, inadequate pavement width, or intersection controls. Alternately, the underlying problem may be caused by a system deficiency such as a need for a bypass, loop facility, connectors, or additional radials.

Capacity Analysis of the Existing System

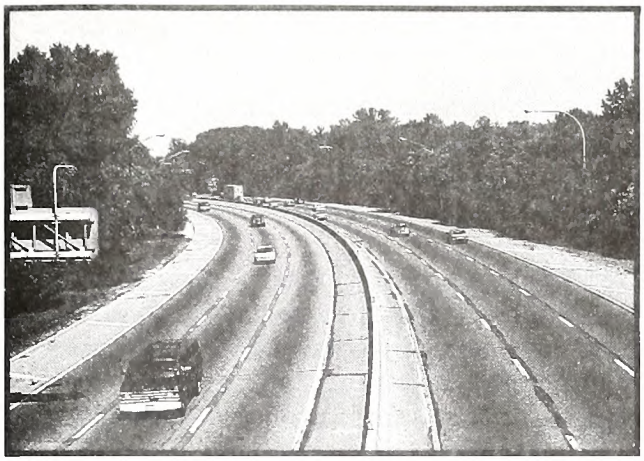
The adequacy of the existing roadway system is evaluated by comparison of traffic volumes to the ability of the facilities to move traffic freely at a desirable speed. In an urban area, spacing of major intersections, degree of access control, pavement width, and the type and spacing of traffic control devices, such as signals, determine the ability of a street to move traffic.

Capacity is the maximum number of vehicles reasonably expected to be able to pass over a given section of roadway, during a given time period under prevailing roadway and traffic conditions. The relationship of traffic volumes to the capacity of the road determines the level of service (LOS) provided. Six levels of service have been defined to represent a range of operating conditions. Figure 7 shows the levels of congestion associated with each LOS. Below is a description of each LOS, in accordance with the 1994 Highway Capacity Manual.

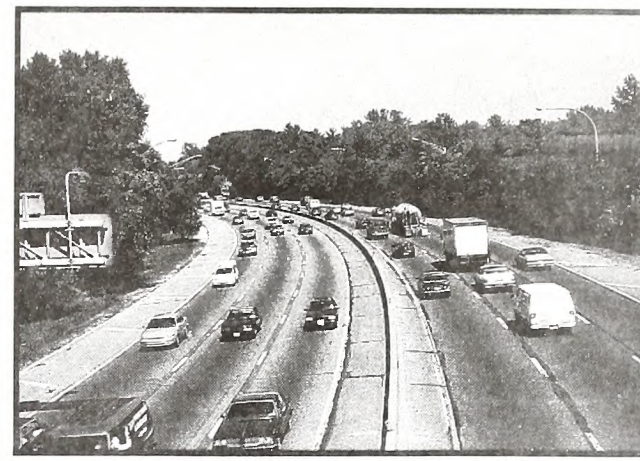
- **LOS A** - describes primarily free flow conditions. Motorists experience high levels of physical and psychological comfort. The effects of minor incidents of breakdown are easily absorbed.
- **LOS B** - represents reasonably free flow conditions. The ability to maneuver within the traffic stream is only slightly restricted.
- **LOS C** - provides for stable operations, but flows approach the range in which small increases cause substantial deterioration in service. Freedom to maneuver is noticeably restricted. Minor incidents may still be absorbed, but the local decline in service is great. Queues may be expected to form behind any significant blockage.
- **LOS D** - borders on unstable flow. Small increases in flow can cause substantial deterioration in service. Freedom to maneuver is severely limited, and drivers experience drastically reduced comfort levels. Minor incidents can be expected to create substantial queuing.
- **LOS E** - describes operation at capacity. Operations at this level are extremely unstable, because there are virtually no usable gaps in the traffic stream. At capacity, the traffic stream has no ability to dissipate any disruption. Any incident can be expected to produce a serious breakdown with extensive queuing.
- **LOS F** - describes forced or breakdown flow. Such conditions generally exist within queues forming behind breakdown points.

The thoroughfare plan recommendations are based on achieving a minimum of LOS D on existing facilities. LOS D is considered the practical capacity of a facility, or that level of congestion at which users perceive conditions to be intolerable. New facilities are designed to provide LOS C. Specific design requirements for any given improvement are determined based on the amount and type of projected traffic, desired level of service, and available right of way.

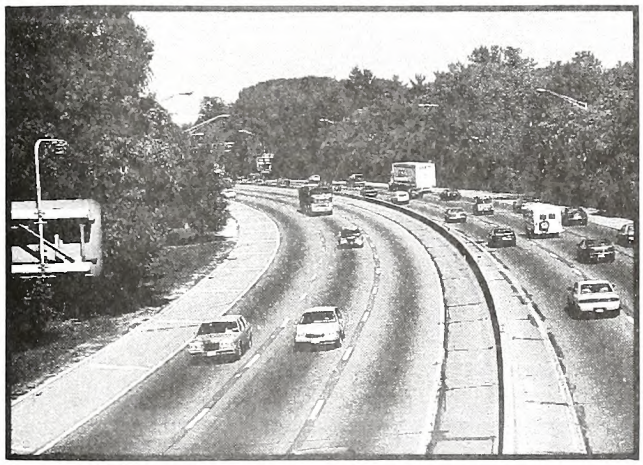
Source: 1994 Highway Capacity Manual



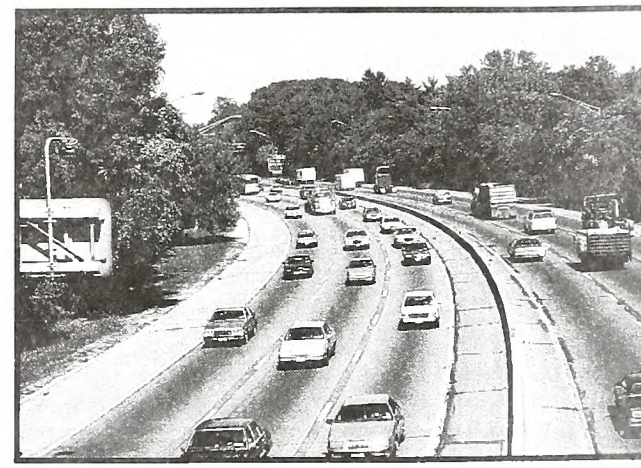
LOS A.



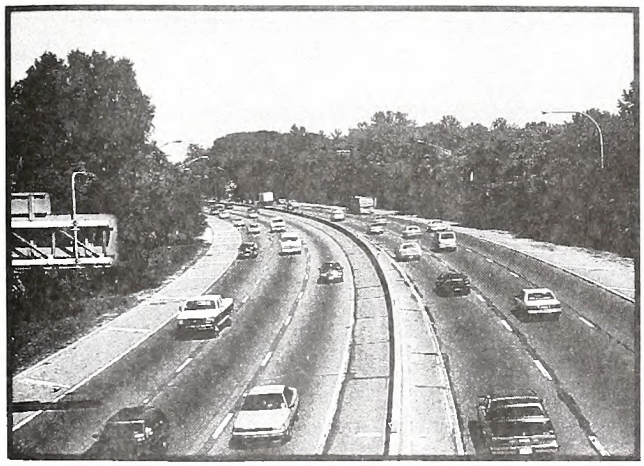
LOS D.



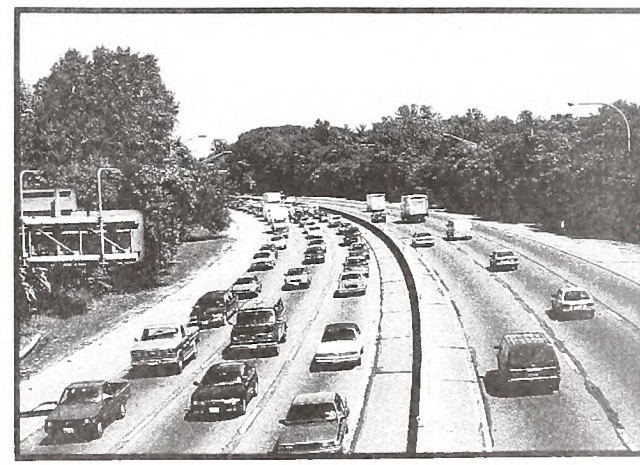
LOS B.



LOS E.



LOS C.



LOS F.

LEVELS OF SERVICE **FIGURE 7**

Traffic Accidents

Traffic accident statistics can often be used as an indicator for locating congestion problems. This data is reviewed to identify problem locations or deficiencies, such as substandard design, inadequate signing, ineffective parking, and poor sight distance. Accident patterns identified from analysis of accident data can lead to improvements that will improve safety.

Data is compiled by accident type in order to identify any trends that may be correctable through roadway or intersection improvements. The total number of accidents and the average accident severity are useful for ranking the most problematic intersections. The severity index is based on a series of weighting factors developed by the NCDOT. These factors define a fatal or incapacitating accident as 47.7 times more severe than one involving only property damage, and an accident resulting in minor injury as 11.8 times more severe than one with only property damage. In general, a higher severity index indicates more severe accidents. Listed below are levels of severity for various severity index ranges.

Severity	Severity Index
low	< 6.0
average	6.0 to 7.0
moderate	7.0 to 14.0
high	14.0 to 20.0
very high	> 20.0

Table 3 is a summary of the intersections in the Pink Hill planning area with the highest accident rates. For each intersection, the total number of accidents is given by type and by average severity index. The criteria used to identify these locations include all accidents within 200 feet of an intersection over a three-year period, July 1995 to June 1998.

Table 3

Pink Hill Highest Accident Intersections

Location	Angle	Rear End	Ran Off Road	Left Turn	Right Turn	Other	Total	Severity
NC 11/ SR 1108	7	1		1			9	4.29
NC 241/ SR 1103	4			3		1	8	12.33

The NCDOT Traffic Engineering and Safety Systems Branch periodically reviews accident data statewide to identify locations where accident rates may be reduced as a result of roadway improvements. The highest accident intersections, roadway sections, and bridge locations statewide are listed semi-annually in Highway Safety Improvement Programs.

To be included in the Highway Safety Improvement Program, each location must meet one of several warrants, or minimum criteria. For intersections, the categories of warrants are front impact crash rate, previous year crash rate, severity index level, night crash rate without streetlights, and chronic accident type. For roadway sections, the categories of warrants are: run off road crash rate in wet conditions, run off road crash rate, crash rate in wet conditions, and night crash rate without streetlights.

Of the locations included in the Highway Safety Improvement Program, those ranked highest statewide are studied further by NCDOT Area Traffic Engineers. In Pink Hill, the intersection of NC 11 and SR 1108 (Pine Street) is included in the 1998 Fall Highway Safety Improvement Program because it meets the chronic accident type warrant, which in this case is a crossing pattern. No other intersections, roadway sections, or bridge locations in the Pink Hill planning area are included in the 1998 Fall Highway Safety Improvement Program.

Table 4 gives a summary of improvements, planned or completed, that may positively impact the highest accident intersections in Pink Hill. To request a more detailed analysis for any intersection of concern, the appropriate Area Traffic Engineer, which is Area 1 for Pink Hill, should be contacted.

Table 4

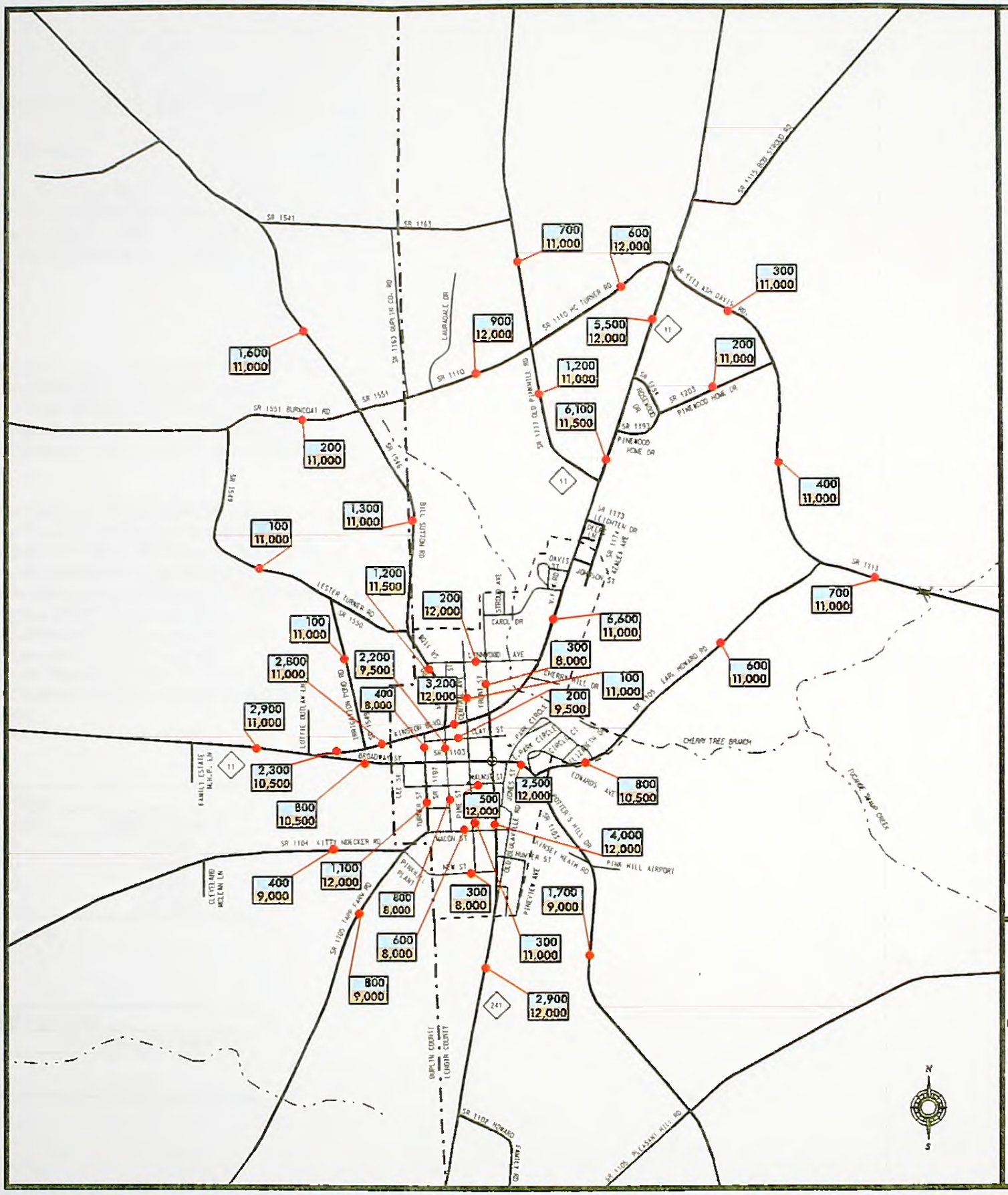
Project Status for Identified Highest Accident Intersections

Intersection	Status
NC 11/ SR 1108*	TIP Project R-2204 (will reduce NC 11 traffic, potentially reducing the accident rate)
NC 241/ SR 1103	currently signalized, no recommendation

Note: * - included in the 1998 Fall Highway Safety Improvement Program.

Current Deficiencies of the Roadway System

The current deficiencies of the existing roadway system are determined by comparing the existing traffic on each facility with its capacity. Figure 8 shows the 1998 average daily traffic and the existing capacities on streets throughout the Pink Hill planning area. Based on this comparison of traffic volumes to roadway capacities, no facilities in the Pink Hill planning area are currently experiencing any significant capacity problems in the base year, 1998.



1998 AVERAGE DAILY TRAFFIC WITH EXISTING ROADWAY CAPACITIES

LEGEND

AVERAGE DAILY TRAFFIC
ROADWAY CAPACITY

00000
00000

FIGURE 8

PINK HILL
NORTH CAROLINA

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U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

SCALES

0 600 1200 1800 2400 3000
feet

0 200 400 600 800 1000
meters

Analysis of Future Travel Demand on the Roadway System

Projections of Factors Affecting Future Travel Demand

In order to formulate a thoroughfare plan for the planning year 2025, it is necessary to evaluate factors affecting the future travel demand. An area's population, vehicle usage trends, economy, and land use patterns play a significant role in determining the transportation needs. Additional factors may include the effects of legal controls such as subdivision regulations and zoning ordinances, availability of public utilities, and physical features of the area.

Population

The magnitude and dispersion of population in a given area directly impacts the amount of traffic on roads serving the area. Investigating past trends and projecting future population growth and dispersion is an essential step in transportation planning. The Pink Hill planning area for the base year, 1998, is estimated by applying an occupancy rate (average number of persons per dwelling unit), from census data for Pink Hill and Lenoir and Duplin Counties, to the total amount of housing, as determined as part of the socioeconomic data collection.

The Pink Hill planning area population is projected to the planning year, 2025, based on historic growth trends in the area. The North Carolina Office of State Budget and Management develops population projections for municipalities and counties throughout the state. Population trends for the town of Pink Hill, as well as for Lenoir and Duplin Counties, are considered in projecting the population for the planning area. Added to the growth expected based on past trends is the expected population increase due to the outgrowth of the Global Transpark (GTP) in Lenoir County. The population increase due to the GTP is estimated from the population to employment ratio being applied to the indirect employment expected (refer to *North Carolina Global Transpark - Documentation of Travel Demand Model,* April 1996, Statewide Planning Branch, NCDOT). Table 5 gives the population trend and projections for Pink Hill and Lenoir and Duplin Counties. Table 6 shows the population projection for the Pink Hill planning area.

Table 5
Population Trends and Projections

Year	Pink Hill	Lenoir County	Duplin County
1970	520	55,200	38,000
1980	640	59,800	41,000
1990	550	57,300	40,000
2020		58,400[a]	48,400[a]

Note: [a]Estimate by the Office of State Budget and Management

Table 6
Pink Hill Planning Area Population Projection

Year	Population	% Growth Per Year
1998	1200	
2025	1400	0.57

Socioeconomic Data

As discussed briefly in the 'Travel Forecast Model Development' section of this chapter and in more detail in Appendix B, socioeconomic data is used to develop a model of travel conditions in the planning area. The housing and employment data for Pink Hill, collected in 1998, is projected to the planning year, 2025, to create a travel forecast model of anticipated future conditions. These projections were developed and distributed to various planning area zones in cooperation with Pink Hill town officials.

Housing Projection

The housing projection is based on the population projection for the Pink Hill planning area. An occupancy rate (persons per dwelling unit), based on historical trends for Pink Hill and Lenoir and Duplin Counties, is applied to the projected population to estimate the future number of dwelling units. Using this method, housing is projected to increase from a total of 460 dwelling units in 1998 to 620 dwelling units by 2025. Growth resulting from development of the Global Transpark is accounted for in this housing projection since it is based on a population projection which incorporates these impacts (refer to the previous section, 'Population'). The total projected number of dwelling units is distributed to zones throughout the planning area based on local input about expected development patterns. Figure 9 shows the housing data by zones for the Pink Hill planning area for the base year and the planning year.

Employment Projection

The employment projection for the Pink Hill travel forecast model is also based on the population projection, which includes growth anticipated due to the Global Transpark. An employment to population ratio for the planning area, based on historical trends for Lenoir and Duplin Counties, is applied to the projected population to estimate the future amount of employment. The projected total employment is distributed into employment categories, based on the market share of each in the base year and expected trends in each industry. The employment categories, which are based on Standard Industrial Classification (SIC), are described below.

- **Industrial** (SIC codes 1-49) - agriculture, construction, manufacturing, transportation
- **Retail** (55, 58) - all types of wholesale and retail trade
- **Special Retail** (50-54, 56, 57, 59) - gasoline service stations, restaurants
- **Office** (60-67, 91-97) - personal, business, health, legal, education, social services
- **Service** (70-76, 78-89, 99) - finance, insurance, real estate, public administration

The employment projection is dispersed among zones throughout the planning area based on local input on development trends. Table 7 gives the Pink Hill planning area total employment data by category for 1998 and 2025. Figure 10 shows the base year and planning year employment data for Pink Hill by planning area zones.

Table 7

Employment Data and Projections for the Pink Hill Planning Area

Employment Category	1998 Employment	2025 Employment
Industry	146	336
Retail	80	162
Special Retail	32	53
Office	29	47
Service	151	250
TOTAL	440	848

Land Use

Land use refers to the physical patterns of activities and functions within a municipality or county. Traffic problems in a given area often can be attributed to adjacent land use. For example, a large industrial plant during times when shifts change may cause traffic congestion on a road that otherwise has little, if any, congestion.

The spatial distribution of different types of land uses is a predominant determining factor of when, where, and to what extent traffic congestion occurs. The travel demand between areas of different land uses and the resulting impact on traffic conditions varies depending on the size, type, intensity, and spatial separation of development. Evaluating growth patterns and expected future land use facilitates the development of proposals to meet anticipated future transportation needs. For the purposes of transportation planning, land use is categorized as defined below.

- **Residential** - land devoted to the housing of people (excludes hotels and motels)
- **Commercial** - land devoted to retail trade, including consumer and business services and offices
- **Industrial** - land devoted to manufacturing, storage, warehousing, and transportation of products
- **Public** - land devoted to social, religious, educational, cultural, and political activities

Currently, the Pink Hill planning area is characterized by some residential development downtown and sparse residential development throughout the surrounding area. The majority of the commercial and industrial development is located downtown and along NC 11. Public land use in the planning area includes the Pink Hill Elementary School, located downtown, as well as various municipal facilities and churches.

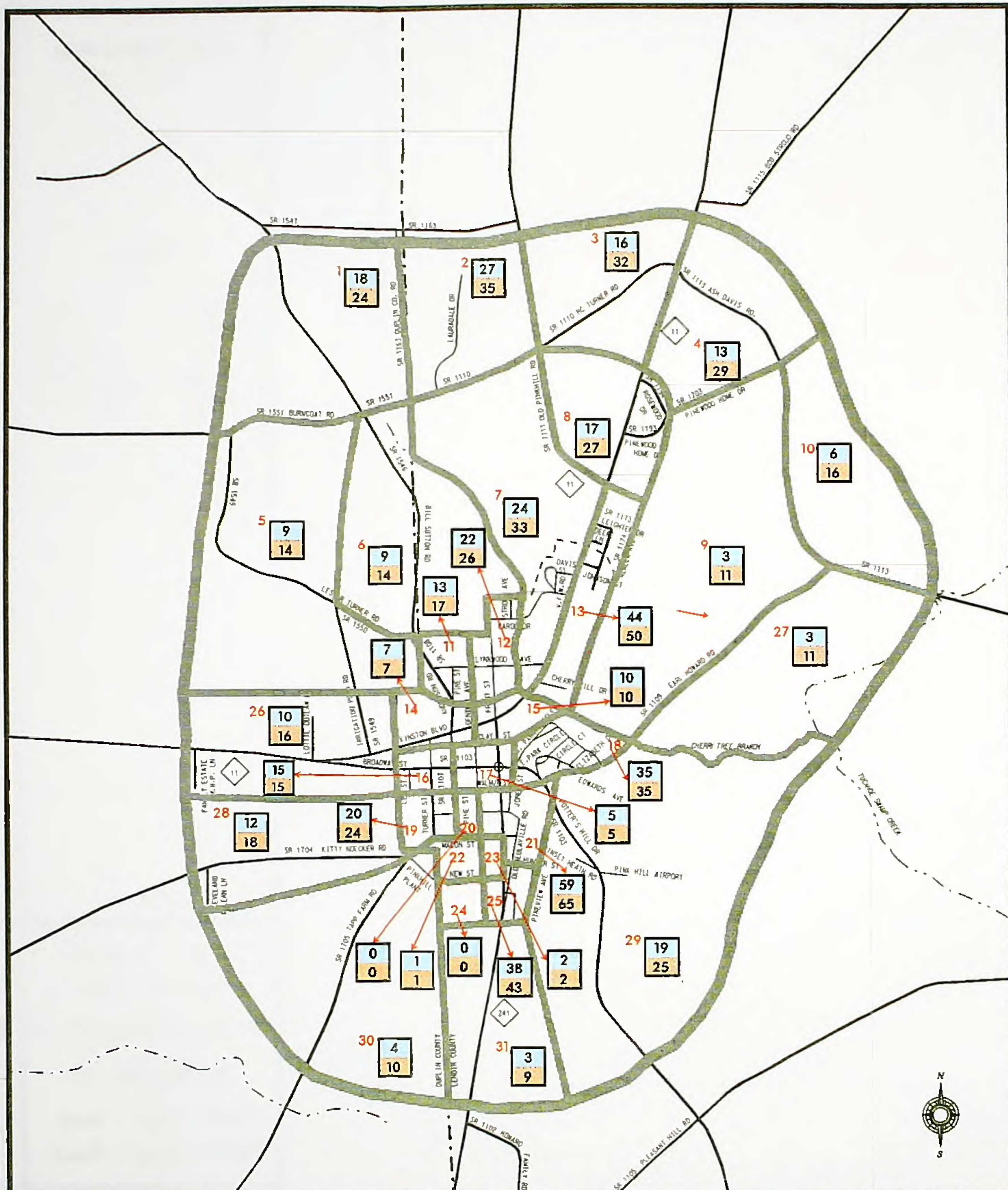
Anticipated future land use is, in general, a logical extension of the present spatial distribution. The northern part of the Pink Hill planning area is expected to have the highest growth rate. Residential growth is expected to be primarily in outlying areas, due to the current development density within Pink Hill town limits. Future commercial and industrial development is expected to be greatest along existing NC 11 and the proposed bypass corridor.

Anticipated Future Deficiencies of Roadway System

To develop thoroughfare plan recommendations to meet the needs of the area, anticipated future deficiencies of the roadway system are evaluated. Similar to the deficiency analysis for existing conditions, future conditions are studied by comparing the projected amount of traffic on each facility with its capacity. Figure 11 shows the average daily traffic projected for 2025 and the existing capacities on streets throughout the Pink Hill planning area.

Based on this analysis, NC 11 is the only facility in the area expected to have traffic volumes that exceed the roadway capacity by the planning year 2025. The current average daily traffic on NC 11 in the vicinity of Pink Hill, north of NC 241, is approximately 7,000 vehicles per day (vpd). The traffic projected to be using NC 11 by the year 2025 is approximately 12,000 vpd. Refer to Figure 8 and Figure 11 for 1998 and 2025 average daily traffic volumes, respectively. Since the capacity of this two-lane facility is approximately 11,000 vpd, capacity problems are expected to develop as traffic volumes increase. Refer to Chapter 2 for details of the improvements proposed to alleviate this deficiency, as well as lane width and intersection deficiencies.

HOUSING DATA BY ZONE



LEGEND

CORDON LINE	
ZONE LINE	
ZONE NUMBER	00
1998 HOUSING	00
2025 HOUSING	00

FIGURE 9

PINK HILL
NORTH CAROLINA

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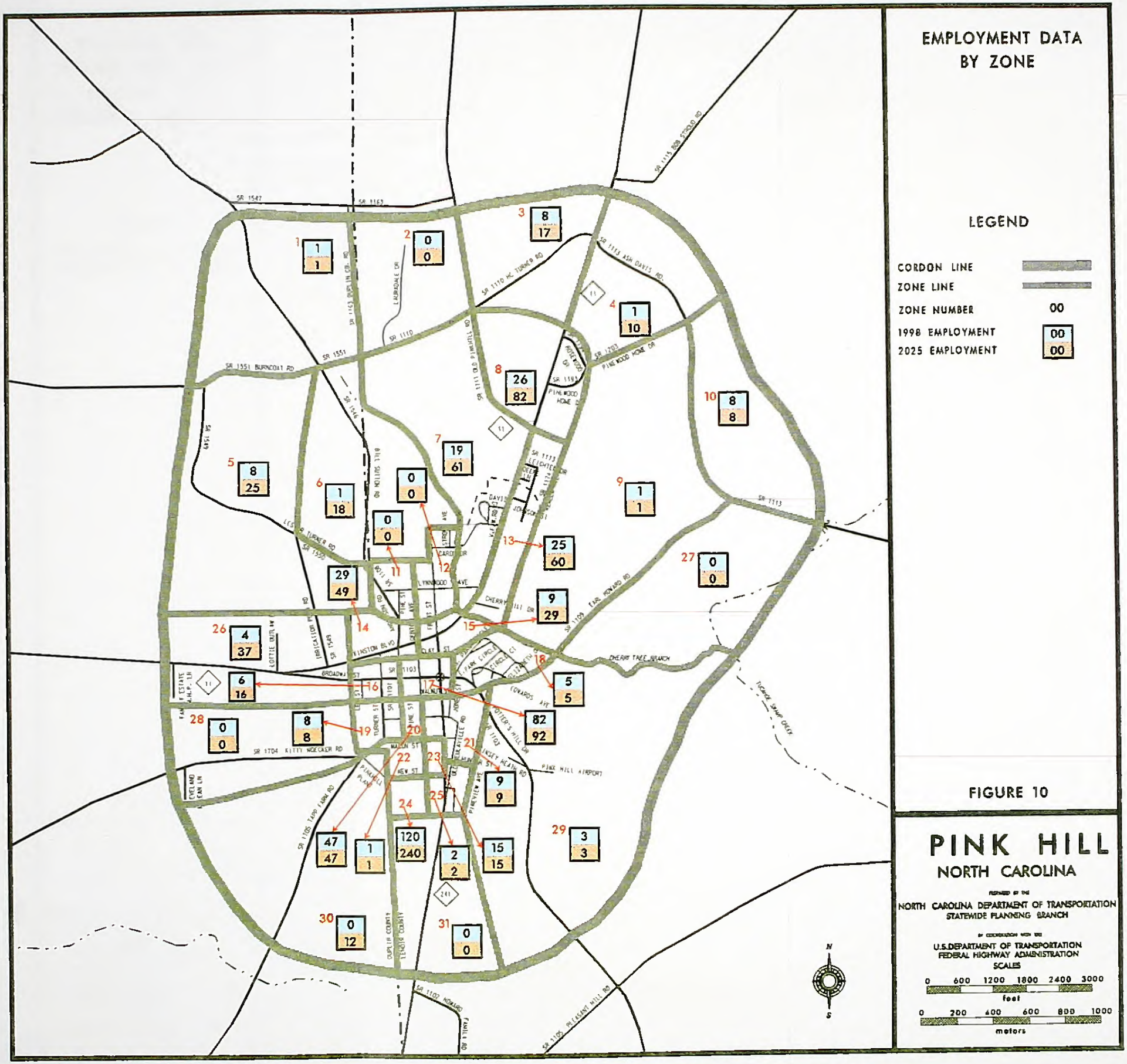
FEDERAL HIGHWAY ADMINISTRATION

SCALES

0 600 1200 1800 2400 3000
feet

0 200 400 600 800 1000
meters


EMPLOYMENT DATA
BY ZONE
LEGEND
CORDON LINE
ZONE LINE
ZONE NUMBER 00
1998 EMPLOYMENT 00
2025 EMPLOYMENT 00
FIGURE 10
PINK HILL
NORTH CAROLINA
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH
U.S.DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
SCALES
0 600 1200 1800 2400 3000
feet
0 200 400 600 800 1000
meters
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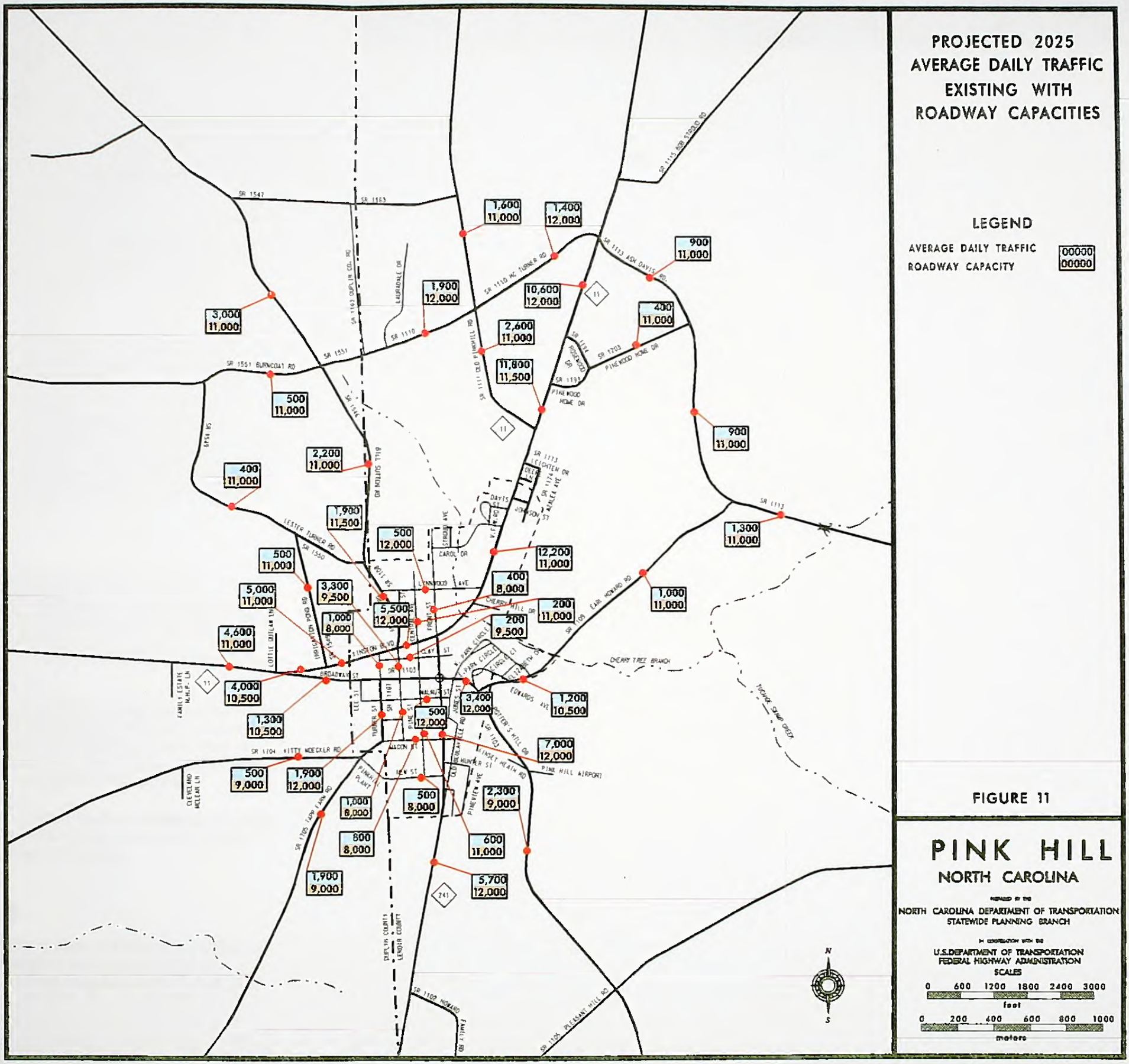
S


PROJECTED 2025
AVERAGE DAILY TRAFFIC
EXISTING WITH
ROADWAY CAPACITIES
LEGEND
AVERAGE DAILY TRAFFIC
ROADWAY CAPACITY
00000
00000
FIGURE 11
PINK HILL
NORTH CAROLINA
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STATEWIDE PLANNING BRANCH
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
SCALES
0 600 1200 1800 2400 3000
feet
0 200 400 600 800 1000
meters
N
S
SR 1547
SR 1163
SR 1163 DUPLIN COUNTY RD
SR 1110
SR 1551
SR 1551 BURNCOAT RD
SR 1546
SR 1111 OLD PINKHILL RD
SR 1133 ASH DAVIS RD
SR 1703
SR 1173 LEIGHTEN DR
SR 1174 AURLEA AVE
SR 1113
SR 1350 LESTER TURNER RD
SR 1105 EARL HOWARD RD
SR 1107
SR 1101
SR 1704 KITTY MOECKLER RD
SR 1105 LOPER FARM RD
SR 1103
SR 1109 HOWARD
SR 1105 PLEASANT HILL RD
DUPLIN COUNTY
LENOIR COUNTY
PINE HILL AIRPORT
CHERRY TREE BRANCH
TOMAHAWK CREEK
11
741
3,000 11,000
1,600 11,000
1,400 12,000
900 11,000
1,900 12,000
10,600 12,000
2,600 11,000
400 11,000
11,800 11,500
500 11,000
2,200 11,000
400 11,000
1,900 11,500
500 12,000
12,200 11,000
500 11,000
3,300 9,500
5,000 11,000
5,500 12,000
400 8,000
1,000 8,000
200 11,000
200 9,500
4,600 11,000
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1,300 11,000
4,000 10,500
3,400 12,000
1,200 10,500
500 12,000
1,300 10,500
7,000 12,000
500 9,000
1,900 12,000
1,000 6,000
500 8,000
2,300 9,000
800 8,000
600 11,000
1,900 9,000
5,700 12,000

Consideration of Environmental Factors

In recent years, environmental considerations associated with highway improvements or construction have come to the forefront of the planning process. The legislation that dictates the necessary procedures regarding environmental impacts is the National Environmental Policy Act of 1969. Section 102 requires the development of a detailed statement on the environmental impact of any proposed action, including evaluation of alternatives and documentation of any unavoidable adverse effects. The North Carolina Department of Transportation develops environmental impact statements (EIS) for roadway projects that have a significant impact on the environment and less detailed statements, such as categorical exclusions and environmental assessments, for other projects. Typical environmental analysis involves evaluation of a project's impact on wetlands, water quality, historic properties, wildlife, and public lands.

This technical report for the Pink Hill thoroughfare plan is not intended to cover environmental concerns in as much detail as an EIS. However, preliminary research on environmental factors is generally done at the thoroughfare planning stage in order to select the appropriate corridor for proposed improvements. For the major new location projects proposed as part of the Pink Hill Thoroughfare Plan, TIP Projects R-2001 and R-2204, environmental assessments have been completed by NCDOT's Project Development and Environmental Analysis Branch. Therefore, since the environmental factors described below have been reviewed as part of the development of the environmental assessment, it is unnecessary to conduct a separate review as part of this thoroughfare plan study. Figure 12 shows general environmental information for the Pink Hill planning area.

Wetlands

In general terms, wetlands are areas where saturation with water is the dominant factor in determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. The single characteristic that most wetlands share is soil or substrata that is at least periodically saturated with or covered by water. Unique species inhabit wetlands since water creates severe physiological problems for all plants and animals except those that are adapted for life in water or in saturated soil.

Wetlands are crucial ecosystems in our environment. They help regulate and maintain the hydrology of our rivers, lakes, and streams by slowly storing and releasing floodwaters. They help maintain the quality of our water by storing nutrients, reducing sediment loads, and reducing erosion. They are also critical to fish and wildlife populations. Wetlands provide an important habitat for about one third of the plant and animal species that are federally listed as threatened or endangered.

The impacts to wetlands can be evaluated using the National Wetlands Inventory Mapping, available from the U. S. Fish and Wildlife Service. Wetland impacts are to be avoided or minimized to the greatest extent possible, while preserving the integrity of the thoroughfare plan.

Threatened and Endangered Species

A review of Federally Listed Threatened and Endangered Species is done to determine the effect new corridors or widened roadways could have on wildlife. Threatened or endangered species are identified using mapping from the North Carolina Department of Environment, Health, and Natural Resources.

The Threatened and Endangered Species Act of 1973 allows the U. S. Fish and Wildlife Service to impose measures for mitigation of the environmental impacts of a road project on endangered plants and animals and critical wildlife habitats. By locating rare species in the planning stage of roadway construction, avoidance or minimization of these impacts is possible. Further, a detailed field investigation is conducted prior to construction of any transportation project.

Historic Sites

The location of historic sites is investigated to determine the potential impacts of the various transportation project proposals. The federal government has issued guidelines requiring all state transportation departments to make specific efforts to preserve historic sites. In addition, the state of North Carolina has issued its own guidelines for the preservation of historic sites. These two pieces of legislation are described below.

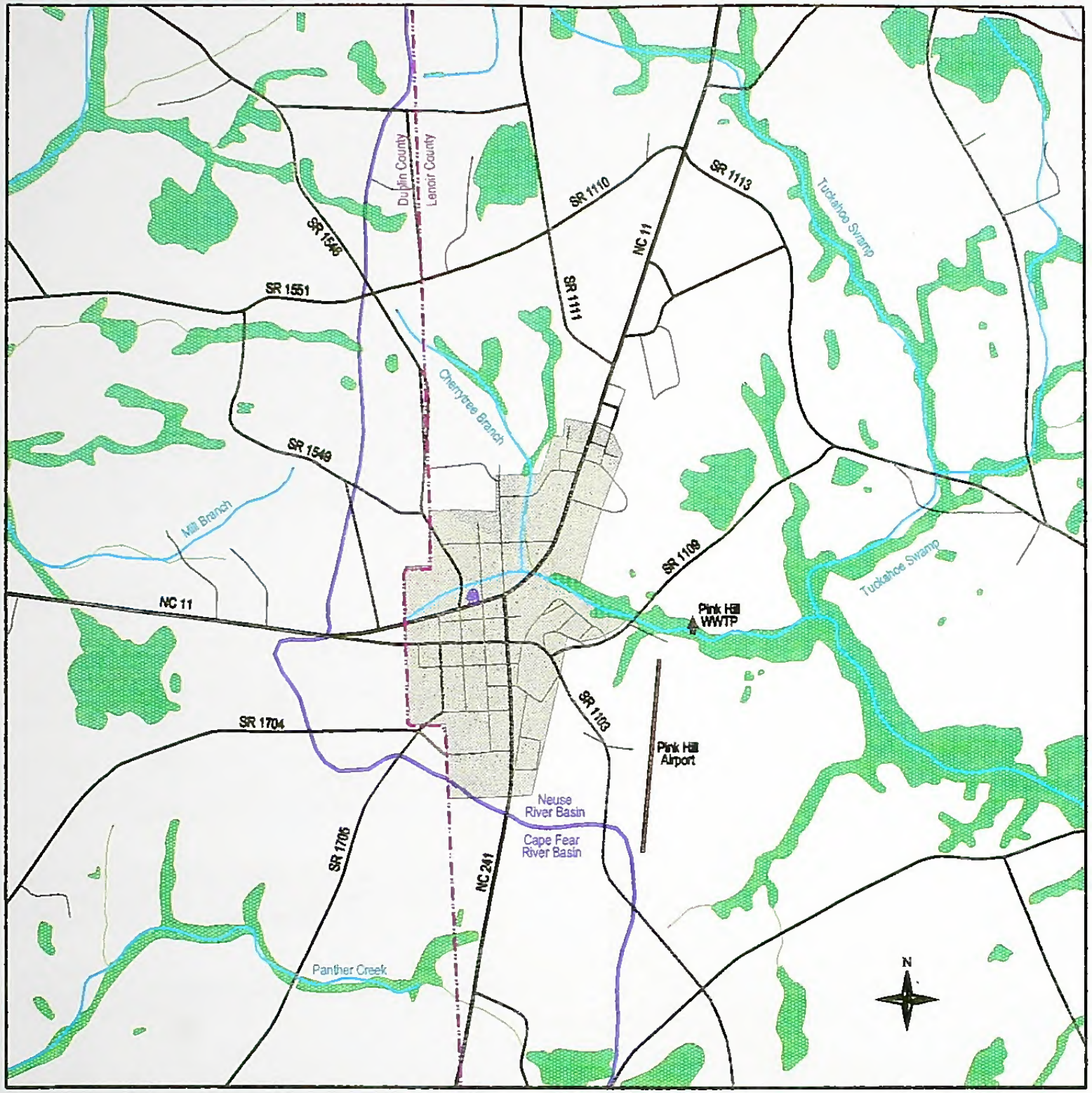
National Historic Preservation Act - Section 106 requires state departments of transportation to identify historic properties listed in the National Register of Historic Places and properties eligible to be listed. State departments of transportation must consider the impacts of transportation projects on these properties and consult with the Federal Advisory Council on Historic Preservation.

NC General Statute 121-12(a) - This statute requires the NCDOT to consider impacts of transportation projects on National Register properties. The North Carolina Historical Commission is given an opportunity to review potential impacts and make advisory recommendations.

The State Plan for Historic Preservation is used to identify historic sites within a given area. All reasonable efforts are made to minimize the impact to identified historic sites and natural settings when widening existing roadways or constructing new facilities. A more detailed study is done in regard to local historic sites prior to construction of any project.

Archaeology

Any significant archaeological sites located in the area will be identified prior to any roadway improvements or construction. All reasonable efforts are made to avoid or minimize impacts to archaeological sites.



PINK HILL ENVIRONMENTAL DATA

LEGEND

County Boundary (100K)
- County Boundary
- State Boundary

NPDES - Non Discharge Systems (100k)

NPDES - Point Source Dischargers (24k)

Surface Water Intakes (100k)

Groundwater Incidents (100k)

Nat. Heritage Occurence Sites (Restricted-100k)

Hist. Struct.-NR (Restricted-100k)

Hist. Dist. -NR (Restricted-100k)

Hist. Struct.-SL(Restricted-100k)

Hist. Dist.-SL(Restricted-100k)

Solid Waste Facilities (24k)

Hazardous Waste Facilities (Unverified 24k)

Superfund Pts. (Haz. Subs. Dispos. Sites)

Superfund Areas (Haz. Subs. Dispos. Sites)

Sub.Root Vasculars (point-24k)

Sub. Root Vasculars (poly-24k)

Roads (DOT 24k - no attributes)
- Railroad
- Interstate
- US
- NC
- SR
- City
- Other

Pipe,Transmission & Airports (100k)

Airports / Substations
- Airport
- Power Substation

Prop. Critical Habitat Areas (1 mile buffer-24k)

Trout Streams (WRC - 100k)

Trout Streams (DWQ - 100k)

Anadromous Fish Spawning Areas (100k)

Fish Nursery Areas (24k)

Hydro - Rivers/Streams (100k)

Hydro -Water Bodies (100k)

Hydro - Major Rivers/Streams (100k)

Hydro - Major Water Bodies (100k)

NWI (arc-24k)

NWI (poly-24k)

HQW Zones (100k)

Water Supply Watersheds (24k)
- Critical
- Protected

Municipal Boundaries (24k)

State Parks (100k)

Federally Owned Lands (100k)

River Basins - Minor (24k)

Hydrologic Units (24k)

1000 0 1000 2000 Feet

FIGURE 12

Appendix A
Thoroughfare Planning Principles

Thoroughfare planning provides many advantages, with the primary objective being to assure that the road system will be progressively developed to serve future travel desires. Thus, the main consideration in thoroughfare planning is to make provisions for street and highway improvements so that, when the need arises, feasible opportunities to make improvements exist.

Benefits of Thoroughfare Planning

There are two major benefits derived from thoroughfare planning. First, each road is designed to perform a specific function and provide a specific level of service. This enables savings to be realized in right of way, construction, and maintenance costs. It also protects residential neighborhoods and encourages stability in travel and land use patterns. Second, thoroughfare planning allows local officials to be informed of future improvements in order to incorporate this information into planning and policy decisions. This permits developers to design subdivisions in a non-conflicting manner, enables school and park officials to better locate their facilities, and minimizes the damage to property values and community appearance that could otherwise be associated with roadway improvements.

Thoroughfare Classification Systems

Roads serve two primary functions, enabling travel to destinations and providing land access. These two functions can be served effectively when traffic volumes and demand to access land are low. However, when traffic volumes are high, conflicts created by uncontrolled and intensely developed abutting property may lead to intolerable traffic flow friction and congestion.

The underlying concept of a thoroughfare plan is that it provides a functional system of roads that permits travel from origins to destinations with directness, ease, and safety. Different roads in this system are designed to perform specific functions, thus minimizing the conflict between providing traffic service and land access.

For urban thoroughfare plans, roadways are classified as major thoroughfares, minor thoroughfares, or local access streets. There is a different classification system for rural roadways in a county thoroughfare plan, but only the urban classification system is described below.

Major Thoroughfares
Major thoroughfares are the primary traffic arteries of the urban area and they accommodate traffic movements within, around, and through the area.

Minor Thoroughfares
Roadways classified as minor thoroughfares collect traffic from the local access streets and carry it to the major thoroughfare system.

Local Access Streets

This classification includes all streets that have a primary purpose of providing access to the abutting property. Local access streets are further classified as residential, commercial, or industrial, depending upon the type of land use that is served.

Idealized Major Thoroughfare System

An idealized major thoroughfare system is a coordinated system of roadways that is most adaptable to the desired lines of travel within an urban area. Most urban area thoroughfare plans use a radial-loop system, which includes radial, crosstown, loop, and bypass facilities. Refer to Figure A-1 for representation of this type of idealized major thoroughfare system.

Radial streets are designed to provide for traffic movement between points located on the outskirts of the municipality and the central area. This is a major traffic movement in most cities, and the economic strength of the central business district depends upon the adequacy of this type of thoroughfare.

If all radial streets crossed in the central area, an intolerable congestion problem would result. To avoid this problem, it is very important to have a system of crosstown streets that form a loop around the central business district. This system allows traffic moving from origins on one side of the central area to destinations on the other side to follow the area's border. It also allows central area traffic to circle and then enter the area near a given destination. The effect of a good crosstown system is to free the central area of crosstown traffic, thus permitting the central area to function more adequately in its role as a business district.

Loop system streets move traffic between suburban areas of the city. Although a loop may completely encircle the city, a typical trip may be from an origin near a radial thoroughfare to a destination near another radial thoroughfare. Loop streets do not necessarily carry heavy volumes of traffic, but they function to help relieve central areas. There may be one or more loops, depending on the size of the urban area. They are generally spaced one-half mile to one mile apart, depending on the intensity of land use.

A bypass is designed to carry traffic through or around the urban area, thus providing relief to the city street system by removing traffic that does not have a destination in the city. Bypasses are usually designed to standards for highways supporting large volumes of high-speed traffic, including control of access. Occasionally, a bypass with low traffic volume can be designed to function as a portion of an urban loop. The general effect of bypasses is to expedite the movement of through traffic and to improve traffic conditions within the city. By freeing the local streets for use by shopping and home-to-work traffic, bypasses tend to increase the economic vitality of the local area.

Objectives of Thoroughfare Planning

Thoroughfare planning is the process public officials use to assure the development of the most appropriate roadway system to meet existing and future travel desires within the urban area or county. The primary aim of a thoroughfare plan is to guide the development of the roadway system in a manner consistent with changing traffic patterns. Thoroughfare planning enables road improvements to be made as traffic demands increase and ensures only needed improvements are implemented. By developing the roadway system to keep pace with increasing traffic demands, maximum utilization of the system can be attained, requiring the minimum necessary amount of land for transportation purposes. In addition to providing for traffic needs, urban thoroughfare plans

should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The present and future population dispersion, as well as commercial and industrial development, affects major street and highway locations. Conversely, the location of major streets and highways within a given area influences the local development pattern.

Objectives of a thoroughfare plan include:

* To provide for the orderly development of an adequate major roadway system as land development occurs;
* To reduce travel and transportation costs;
* To reduce the cost of major roadway improvements to the public through the coordination of the roadway system with private action;
* To enable private interest to plan their actions, improvements, and development with full knowledge of public intent;
* To minimize disruption and displacement of people and businesses through long-range advance planning for major roadway improvements;
* To reduce environmental impacts, such as air pollution, resulting from transportation; and
* To increase travel safety.

These objectives are achieved through improving both the operational efficiency of thoroughfares, and improving the system efficiency through system coordination and layout.

Operational Efficiency

The operational efficiency of a roadway is improved by increasing the capability of the street to carry more vehicular traffic and people. In terms of vehicular traffic, roadway capacity is defined by the maximum number of vehicles which can pass a given point on a road during a given time period, under prevailing roadway and traffic conditions. Capacity is affected by the physical features of the roadway, prevailing traffic characteristics, and weather.

Physical ways to improve vehicular capacity include:

- **Roadway widening -** Widening of a road from two to four lanes more than doubles the capacity of the road by providing additional maneuverability for traffic.
- **Intersection improvements -** Increasing the turning radii, adding exclusive turn lanes, and channeling movements can improve the capacity of an existing intersection.
- **Improving vertical and horizontal alignment -** Alignment improvements reduce congestion caused by slow moving vehicles.
- **Eliminating roadside obstacles -** Improving lateral clearance reduces side friction and improves a driver's field of sight.

Operational ways to improve roadway capacity include:

- **Control of Access** - A roadway with complete access control can often carry three times the traffic handled by a non-controlled access road with identical width and number of lanes.
- **Parking removal** - Capacity is increased by providing additional roadway width for traffic flow and reducing friction to flow caused by parking and unparking vehicles.
- **One-way operation** - By initiating one-way traffic operations, the capacity of a street can be increased by 20 -50%, depending upon turning movements and overall street width. One-way streets can also improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination.
- **Reversible lanes** - Reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur during peak periods.
- **Signal phasing and coordination** - Restricted traffic flow caused by excessive stop-and-go operation can be improved through signal phasing and coordination.

Altering travel demand is a third way to improve the efficiency of existing streets. Travel demand can be reduced in the following ways:

- **Carpools** - Encouraging the formation of carpools and vanpools for journeys to work and other trip purposes reduces the number of vehicles on the roadway and raises the people-carrying capability of the street system.
- **Alternate mode** - Encouragement of transit and bicycle use reduces vehicular congestion.
- **Work hours** - Programs by industries, businesses, and institutions to stagger work hours, or establish variable work hours for employees, spreads peak travel over a longer time period and thus reduces peak hour demand.
- **Land use** - Planning land use can control development or redevelopment in a more travel efficient manner.

System Efficiency

Another means for altering travel demand on existing facilities is the development of a more efficient system of roads that will better serve travel desires. An efficient transportation system reduces travel distances, time, and user costs. Improvements in system efficiency can be achieved through the design of facilities by functional classification and the development of a coordinated major street system.

Application of Thoroughfare Planning Principles

The concepts presented in the discussion of thoroughfare classification systems, operational efficiency, and system efficiency are conceptual tools available to aid in developing a thoroughfare plan. In practice, however, thoroughfare planning is conducted for established urban areas or counties and is constrained by existing land use and street patterns, existing public attitudes and

goals, and current expectations of future land use. Compromises must be made due to these and the many other factors that affect transportation improvements.

Through the thoroughfare planning process it is necessary, from a practical viewpoint, that certain basic principles be followed as closely as possible. These principles are listed below.

* The plan should be derived from a thorough knowledge of existing travel - its component parts, and the factors that contribute to it, limit it, and modify it.

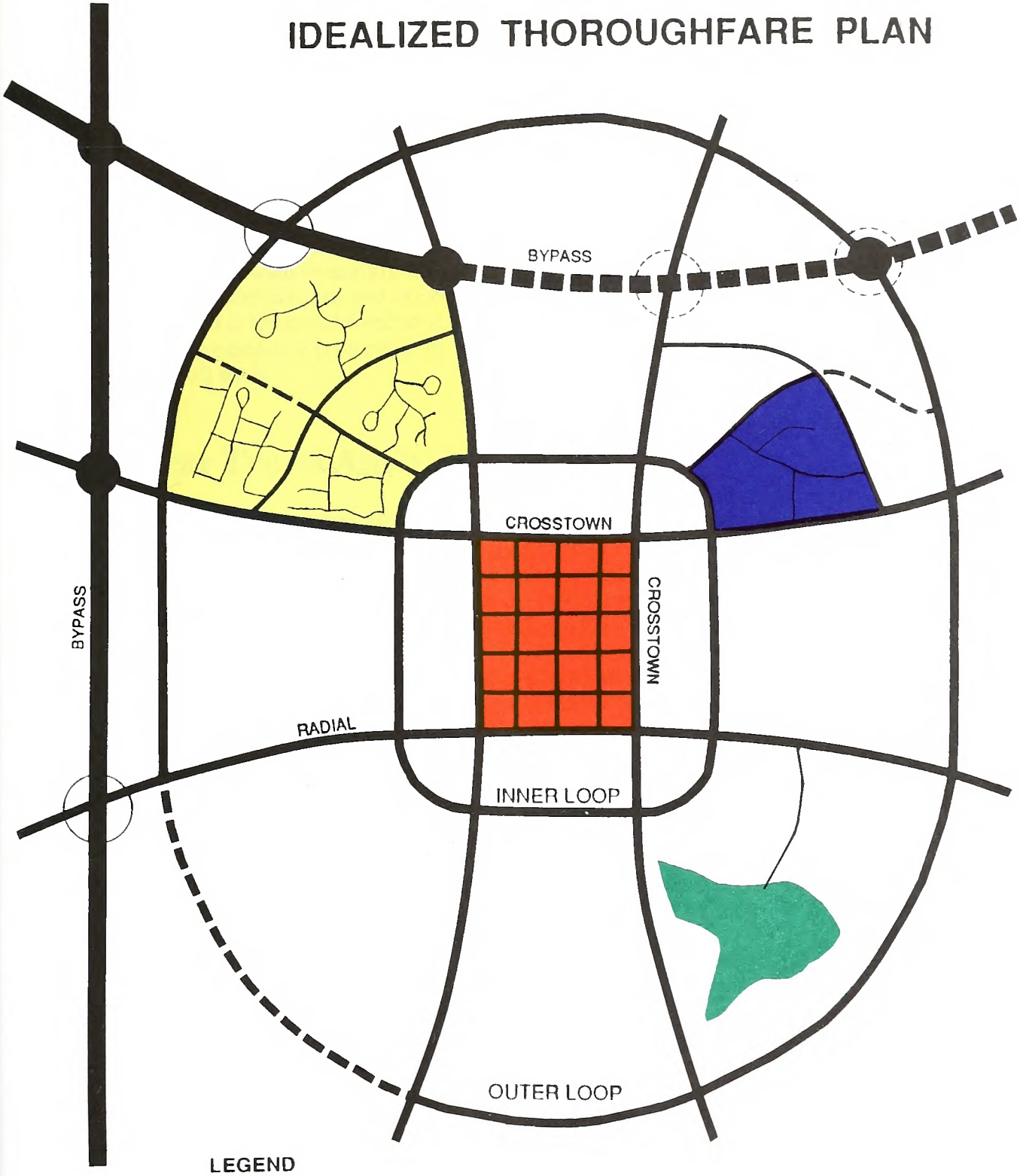
* Traffic demands must be sufficient to warrant the designation and development of each facility. The thoroughfare plan should be designed to accommodate a large portion of major traffic movements on a few roads.

* The plan should conform to and provide for the land development plan for the area.

* Certain considerations must be given to development beyond the current planning period. Particularly in outlying or sparsely developed areas that have development potential, it is necessary to designate thoroughfares on a long-range planning basis to protect right of way for future thoroughfare development.

* While being consistent with the above principles and realistic in terms of travel trends, the thoroughfare plan must be economically feasible.

IDEALIZED THOROUGHFARE PLAN



LEGEND

	EXISTING	PROPOSED
AJOR THOROUGHFARE REEWAY		
IAJOR OTHER		
INOR THOROUGHFARE		
OCAL ROAD		
ITERCHANGE		
RADE SEPERATION		

LAND USES

- COMMERCIAL/BUSINESS
- RESIDENTIAL
- INDUSTRIAL
- PUBLIC/INSTITUTIONAL

FIGURE A-1

Appendix B
Travel Forecast Model

A travel forecast model was developed for Pink Hill as part of the study to update the thoroughfare plan. This model is used to analyze the local street system in order to identify existing and anticipated future deficiencies and to evaluate alternate solutions. Detailed information about the local area is used in the travel forecast model to simulate existing traffic conditions. Future traffic conditions are modeled by projecting the data over some planning period, which is to the year 2025 for the Pink Hill study.

Base Year Travel Analysis

A study area is defined for Pink Hill in order to develop the scope of the study and to provide a systematic approach for collecting data. It is necessary to study an area beyond existing town limits to appropriately analyze traffic patterns and to anticipate municipal growth over the planning period. The planning area is divided into zones of similar land use to facilitate data collection and aggregation. There are 33 zones defined for the Pink Hill planning area (refer to Figure 4).

A network of streets in the Pink Hill planning area is selected to be included in the travel forecast model so that there is enough detail to realistically duplicate existing conditions without hindering the ability to calibrate the model. For Pink Hill, as with most networks, all the major thoroughfares and the most significant minor thoroughfares or collector streets are represented (refer to Figure 5).

Socioeconomic data is collected, by planning area zones, and used as input for the travel forecast model. Housing counts are used to estimate how many trips are generated and employment data is used to model where trips are attracted. The socioeconomic data collected for the Pink Hill planning area is given in Tables B-1 and B-2. Other data about the existing street system, such as distances and speeds, are used to model what routes are taken to travel from given origins to destinations. Traffic counts are taken throughout the study area (refer to Figure 6), including at external stations. Traffic counts at external stations, which are where roads cross the planning area boundary, are used to model through trips (see explanation below). All the traffic counts are used to calibrate the modeled traffic volumes to actual volumes. Other data, such as roadway capacities and lane configurations, are entered in the travel forecast model to aid in using it to evaluate travel conditions and recommendations.

The first major step in creating the travel forecast model is to use the external station traffic counts and socioeconomic data to generate trips. A trip is defined as travel with one origin and one destination. The objective is to generate traffic volumes with the travel forecast model that duplicate the actual volumes on streets in the area. In relation to the planning area, traffic has three main components: through trips, internal-external trips, and internal trips. Through trips begin outside the planning area boundary and pass through the planning area en route to a destination outside the planning area. Internal-external trips (INT-EXT) begin outside the planning area and end inside it, or vice versa. Internal (INT) trips have both their origin and destination inside the planning area. Internal trips are further subdivided by trip purposes: home-based-work (HBW), other-home-based (OHB), and non-home-based (NHB). HBW trips include all travel between home and work. OHB trips refer to travel that originates at home but has any destination other than work. NHB trips

include any travel that originates at some location other than a person's home. Non-home-based secondary (NHBS) trips are a type of internal trip that, like NHB, originates at some location other than one's home, but are made only by vehicles garaged outside the planning area. An example of a NHBS trip is a person who lives outside the planning area and works inside it, who makes a trip from their workplace to lunch inside the planning area.

Through trips are developed using a synthesized estimation procedure (refer to *Technical Report #3, Synthesized Through Trip Table for Small Urban Areas*, October, 1980, Statewide Planning Branch, NCDOT). This procedure involves basing the estimated number of through trips on the planning area population, traffic volumes and truck percentages at external stations, roadway functional classification, and the continuity of routes through the planning area. The through trips generated are subjected to the fratar balancing method to ensure the volumes at external stations are consistent with the total. The through trip volumes that are generated from this procedure may be adjusted based on local travel characteristics, travel surveys previously conducted for similar areas, or during the model calibration process. Table B-3 gives the total traffic count and the through trips from the Pink Hill travel forecast model for the base year, 1998, and the planning year, 2025. These trip volumes are given for each external station and are referred to by their traffic count locations, depicted in Figure 6.

Internal Data Summary (IDS) is a program, developed by the NCDOT Statewide Planning Branch, that uses socioeconomic data to determine the number of trips produced and attracted in each zone in the planning area. The volume of INT-EXT trips is determined to be the traffic counts at the external stations, excluding through trips.

Internal trip productions are based primarily on housing data. The housing data collected for the planning area is categorized by trip generation ranges of excellent, above average, average, below average, and poor. The trip generation rates used in the 1998 Pink Hill travel forecast model are 11.0, 9.5, 8.0, 6.5, and 5.0 trips per household per day, respectively, with the average trip generation rate being 6.8. In addition to trip productions based on housing data, trips produced by commercial vehicles are calculated using a trip generation rate of 5 trips per vehicle per day. Each of these trip generation rates is based initially on data for similar urban areas and is adjusted during the calibration of the model to match modeled traffic volumes to actual traffic volumes.

Trips generated using housing and commercial vehicle data accounts for all trips generated inside the planning area. The volume of trips produced by housing units is adjusted to distinguish between those trips that remain in the planning area and those with outside destinations. For Pink Hill, the total volume of internally generated trips is adjusted by a factor that assumes 70% of the trips produced in the planning area also have destinations in the planning area. This adjusted internal travel total is factored into the three trip purposes, home-based-work (HBW), other-home-based (OHB), and non-home-based (NHB). The percentage of total internal trips that each purpose is assigned, 28%, 50%, and 22%, respectively, is based on travel surveys of other similar urban areas.

For INT-EXT trips and internal trips, regression equations are used to model attraction of these total volumes of traffic to certain planning area zones using primarily employment. The regression equations used have been developed from origin and destination surveys by NCDOT for various cities throughout North Carolina. This historic data is reviewed and equations from similar areas are selected and calibrated to the urban area being modeled. Individual equations are developed for the trip purposes, HBW, OHB, NHB, and INT-EXT, since different trip characteristics, such as average trip length, are associated with each. The equations include variables to account for varying trip attraction by employment categories of industrial, retail, special retail, office, and service, as well as a variable for trip attraction to dwelling units. Refer to Chapter 4 for more information on the

employment data by category. The regression equations used for the Pink Hill travel forecast model are given below.

Regression Equations

HBW $Y = 1.0 X_1 + 1.0 X_2 + 1.0 X_3 + 1.0 X_4 + 1.0 X_5 + 1.0 X_6$

OHB $Y = 0.1 X_1 + 1.83 X_2 + 6.0 X_3 + 2.6 X_4 + 2.55 X_5 + 0.5 X_6$

NHB $Y = 0.3 X_1 + 1.83 X_2 + 6.0 X_3 + 2.6 X_4 + 2.55 X_5 + 0.5 X_6$

INT-EXT $Y = 0.5 X_1 + 1.83 X_2 + 6.0 X_3 + 2.6 X_4 + 2.55 X_5 + 1.75 X_6$

Where: Y = attraction factor for each zone

X_1 = Industrial employment (SIC codes 1-49)

X_2 = Retail employment (SIC codes 55, 58)

X_3 = Special Retail employment (SIC codes 50-54, 56, 57, 59)

X_4 = Office employment (SIC codes 60-67, 91-97)

X_5 = Service employment (SIC codes 70-76, 78-89, 99)

X_6 = dwelling units

In addition to internally generated trips, the volume of internal trips made by vehicles from outside the planning area is determined. Non-home-based secondary (NHBS) trips are estimated by applying a factor to the portion of INT-EXT trips that are generated by vehicles garaged outside the planning area. The NHBS trip factor accounts for the estimated number of trips expected to be generated by each vehicle that enters the planning area. The NHBS trip factor generally ranges from 0.4 to 0.7, depending on the amount of opportunities in the area to make extra trips. A NHBS factor of 0.5 is used for the Pink Hill travel forecast model. NHBS trips are added to the internally produced NHB trips.

After calculating total trip productions, primarily from housing data, and the trip attractions, using the regression equations based on employment, the productions and attractions must be balanced. Therefore, the total trips produced and attracted to each zone in the planning area is known.

The next step in creating the travel forecast model is to distribute the trips to determine where the productions from each zone go and where the attractions in each zone come from. Trips are distributed to zones in the planning area using a gravity model. The gravity model equations are based on the principal that transportation demand between zones is proportional to the productions and attractions in each zone. The gravity model also incorporates travel time factors, called friction factors, based on distance and travel time, since travel is inversely related to the impedance between zones. The friction factors used in the Pink Hill travel forecast model are given in Table B-4.

To ensure that the travel forecast model accurately represents existing travel patterns, the model is calibrated. During the calibration process, the modeled traffic volumes are adjusted to the actual traffic counts taken throughout the planning area. Calibration is an iterative process in which incremental changes are made to the model variables until an acceptable degree of accuracy has been achieved. It is generally desirable to have 95% of the modeled traffic volumes within 10% of the actual traffic counts. Additional accuracy checks are also employed. For example, screenlines, imaginary lines that bisect the entire planning area, are established to compare modeled to actual traffic volumes at the roadway locations crossed. A model is considered to accurately reflect overall travel patterns of the area when the modeled volumes at the screenlines are within 5% of the actual traffic counts. The Pink Hill travel forecast model is calibrated such that the traffic crossing the north-south and east-west screenlines are 101% and 96%, respectively, of the actual volumes. All of the traffic volumes from the model are within 10% or 1,000 of the actual traffic counts.

Planning Year Travel Analysis

The planning year 2025 travel is developed for the travel forecast model using the same techniques employed in developing the 1998 travel. The input data that is projected to the planning year includes population, housing, and employment data. These projections are based on historical growth trends in the area. Refer to Chapter 4 for the population projection and Tables B-1 and B-2 for the socioeconomic data projections. The projected socioeconomic data is used in the travel forecast model to generate projected future internal trips. The future external and through trips are projected from the base year using historic traffic growth rates at each external station.

Trips generation rates are also adjusted to the year 2025 using an equation that takes into consideration vehicle ownership trends, persons per household, and a vehicle usage factor. For the 2025 Pink Hill travel forecast model, the trip generation rate for commercial vehicles remained constant, but the rates for housing are increased from the base year by the method shown below. The resulting trip generation rates for the ranges of excellent, above average, average, below average, and poor are 11.1, 9.6, 8.1, 6.6, and 5.1, respectively, with the resulting average generation rate being 7.2 trips per household per day.

Determination of 2025 Generation Rates

Amount Increase Applied to each 1998 Generation Rate =

(1998 Average Generation Rate * Composite Factor) - 1998 Average Generation Rate

where, Composite Factor =

$$\frac{\text{1998 persons/vehicle}}{\text{2025 persons/vehicle}} * \text{Usage Factor} * \frac{\text{2025 persons/dwelling unit}}{\text{1998 persons/dwelling unit}}$$

Calculations (using persons/vehicle and persons/dwelling unit census data and projections):

Composite Factor = (1.25/ 1.10) * 0.99 * (2.26/ 2.52) = 1.009

Amount Increase = (6.8 * 1.009) - 6.8 = 0.06, round to 0.1

Therefore, the 2025 generation rates are 0.1 greater than the 1998 rates.

After the data projections are developed, the same procedure used to create the base year travel forecast model is used to generate the planning year model. The resulting projected traffic volumes, as well as the base year volumes, from the Pink Hill travel forecast model are given in Table B-5 by trip type.

Table B-1

Housing Data by Trip Generation Rate Category

Planning Area Zone	1998 (Number of Dwelling Units)						2025 (Number of Dwelling Units)					
	Excellent	Above Average	Average	Below Average	Poor	Total	Excellent	Above Average	Average	Below Average	Poor	Total
1	0	0	3	5	10	18	0	0	9	5	10	24
2	1	0	21	4	1	27	1	0	29	4	1	35
3	0	5	10	0	1	16	0	5	26	0	1	32
4	1	3	3	2	4	13	1	3	19	2	4	29
5	0	1	0	1	7	9	0	1	5	1	7	14
6	1	0	3	4	1	9	1	0	8	4	1	14
7	3	1	4	2	14	24	3	1	13	2	14	33
8	1	3	9	1	3	17	1	3	19	1	3	27
9	0	1	1	0	1	3	0	1	9	0	1	11
10	0	0	2	0	4	6	0	0	12	0	4	16
11	0	4	3	6	0	13	0	4	7	6	0	17
12	5	6	7	2	2	22	5	6	11	2	2	26
13	0	1	11	8	24	44	0	1	17	8	24	50
14	0	0	1	1	5	7	0	0	1	1	5	7
15	0	2	4	3	1	10	0	2	4	3	1	10
16	1	4	3	4	3	15	1	4	3	4	3	15
17	0	1	1	3	0	5	0	1	1	3	0	5
18	0	5	24	5	1	35	0	5	24	5	1	35
19	0	0	6	9	5	20	0	0	10	9	5	24
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	2	26	31	59	0	0	8	26	31	65
22	0	0	0	1	0	1	0	0	0	1	0	1
23	0	0	0	0	2	2	0	0	0	0	2	2
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	1	13	24	38	0	0	6	13	24	43
26	0	0	2	0	8	10	0	0	8	0	8	16
27	0	0	1	0	2	3	0	0	9	0	2	11
28	0	0	5	1	6	12	0	0	11	1	6	18
29	0	1	9	5	4	19	0	1	15	5	4	25
30	0	0	1	1	2	4	0	0	7	1	2	10
31	0	0	1	1	1	3	0	0	7	1	1	9
TOTAL	13	38	138	108	167	464	13	38	298	108	167	624

Table B-2

Employment Data by Category

Planning Area Zone	1998 (Number of Employees)						2025 (Number of Employees)					
	Industry	Retail	Special Retail	Office	Service	Total	Industry	Retail	Special Retail	Office	Service	Total
1	0	0	0	0	1	1	0	0	0	0	1	1
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	8	0	0	0	8	0	8	0	0	9	17
4	0	0	0	0	1	1	0	0	0	0	10	10
5	8	0	0	0	0	8	20	0	5	0	0	25
6	0	0	0	0	1	1	12	0	5	0	1	18
7	0	10	6	0	3	19	12	20	11	5	13	61
8	0	0	0	0	26	26	0	40	6	0	36	82
9	1	0	0	0	0	1	1	0	0	0	0	1
10	8	0	0	0	0	8	8	0	0	0	0	8
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	1	3	10	11	25	10	11	3	15	21	60
14	4	16	8	0	1	29	4	22	8	4	11	49
15	0	1	6	0	2	9	0	7	6	4	12	29
16	1	0	0	4	1	6	1	0	0	4	11	16
17	1	22	3	12	44	82	1	22	3	12	54	92
18	0	1	0	0	4	5	0	1	0	0	4	5
19	1	6	0	0	1	8	1	6	0	0	1	8
20	0	0	0	0	47	47	0	0	0	0	47	47
21	0	0	6	3	0	9	0	0	6	3	0	9
22	0	0	0	0	1	1	0	0	0	0	1	1
23	0	15	0	0	0	15	0	15	0	0	0	15
24	120	0	0	0	0	120	240	0	0	0	0	240
25	1	0	0	0	1	2	1	0	0	0	1	2
26	0	0	0	0	4	4	12	10	0	0	15	37
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	1	0	0	0	2	3	1	0	0	0	2	3
30	0	0	0	0	0	0	12	0	0	0	0	12
31	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	146	80	32	29	151	438	336	162	53	47	250	848

Table B-3

Through Trip Travel Data

Traffic Count Location	1998 Total ADT	1998 Through Trip	2025 Total ADT	2025 Through Trip
1	1500	66	2900	132
2	740	20	1600	40
39	5760	3732	11200	7238
3	680	18	1200	36
4	1580	84	2100	122
40	2920	1900	5700	4026
5	800	26	1800	58
6	280	4	300	4
41	2740	2112	4100	3408
7	160	2	300	4
TOTAL	17,160	7,964	31,200	15,068

Table B-4

Friction Factors

Travel Time (min)	HBW	OHB	NHB	INT-EXT
1	2036	5207	3384	2237
2	7329	9899	7031	3889
3	4667	5404	4390	2836
4	1321	1627	1562	1316
5	418	519	601	590
6	371	336	475	388

Table B-5

Travel Data Summary

Trip Type	1998	2025
External Trips		
Through	7,960	15,070
Internal-External	9,200	16,130
Internal Trips		
Home-Based-Work	620	880
Other Home-Based	1,110	1,570
Non-Home-Based	490	690
Commercial Vehicle	160	310
Non-Home-Based Secondary	4,090	7,330
TOTAL	23,630	41,980

Appendix C
Thoroughfare Plan Street Tabulation and Recommendations

This appendix includes a detailed tabulation of all roads identified as elements of the Pink Hill Thoroughfare Plan. The table includes a description the roads by sections, as well as the length, cross section, and right of way for each section. Also included is the existing and projected average daily traffic volumes, the practical roadway capacity, and the recommended ultimate lane configuration. Due to space constraints, the recommended cross sections are given in the following form: number of lanes/ alphabetic code. A detailed description and illustrative figure for each of the alphabetic codes for cross sections can be found in Appendix D. Note that for more information on the recommendations for NC 11, refer to TIP projects R-2001 and R-2204.

The following index of terms may be helpful in interpreting the table:

ADQ - adequate
AVG. - average
Co. - county
DIST - distance
ETL - eastern town limits
EXIST. - existing
LD - divided lanes
N/A - not available
NO. - number
NTL - northern town limits
REC. - recommended
RDWY - roadway
ROW - right-of-way
STL - southern town limits
WTL - western town limits
WP - with parking

Appendix C

Thoroughfare Plan Street Tabulation and Recommendations

FACILITY & SECTION	EXISTING CROSS SECTION					AVG. DAILY TRAFFIC		RECOMMENDATIONS		
	DIST	RDWY	ROW	NO. OF	PRACTICAL			RDWY	PRACTICAL	2025
	mi	ft	ft	LANES	CAPACITY	1998	2025	X-SECT	CAPACITY	ADT
NC 11 (Kinston Blvd)										
WPB - SR 1103	0.40	20	100	2	11,000	2,900	4,600	(See NC 11 Bypass)		1,300
SR 1103 - Lenoir/ Duplin Co. Line	0.20	20	100	2	10,500	2,300	4,000	(See NC 11 Bypass)		300
Lenoir/ Duplin Co. Line - SR 1108	0.17	22	N/A	2	11,000	2,800	5,000	(See NC 11 Bypass)		1,300
SR 1108 - Central Avenue	0.07	30	N/A	2	12,000	3,200	5,500	(See NC 11 Bypass)		1,200
Central Avenue - NC 241	0.07	22	N/A	2	11,000	3,100	5,400	(See NC 11 Bypass)		1,100
NC 241 - NCL Pink Hill	0.60	22	N/A	2	11,000	6,600	12,200	(See NC 11 Bypass)		7,200
NCL Pink Hill - SR 1194	0.53	22	100	2	11,500	6,100	11,800	(See NC 11 Bypass)		4,700
SR 1194 - NPB	0.52	22	100	2	12,000	5,500	10,600	A	54,000	10,700
NC 11 Bypass										
WPB - SR 1546				4				A	54,000	4,000
SR 1546 - SR 1194				4				A	54,000	7,900
NC 241 (Front Street)										
SPB - SCL Pink Hill	0.60	22	60	2	12,000	2,900	5,700	ADQ	ADQ	5,700
SCL Pink Hill - NC 11	0.56	34	60	2	12,000	4,000	7,000	ADQ	ADQ	6,600
SR 1103 (Potter's Hill Road)										
SR 1105 - ECL Pink Hill	1.12	18	N/A	2	9,000	1,700	2,300	K	13,000	2,300
SR 1103 (Broadway Street)										
ECL Pink Hill - NC 241	0.21	32	60	2	12,000	2,500	3,400	ADQ	ADQ	3,400
NC 241 - SR 1107	0.26	46	N/A	2	12,000	2,500	3,700	ADQ	ADQ	3,800
SR 1107 - Lenoir/ Duplin Co. Line	0.16	32	N/A	2	12,000	800	1,300	ADQ	ADQ	1,200
SR 1107 (Turner Street)										
SR 1704/ 1738 - Macon Street	0.10	18	70	2	8,000	1,100	2,000	ADQ	ADQ	2,000
Macon Street - SR 1103	0.17	40	70	2	12,000	1,100	1,900	ADQ	ADQ	2,000
SR 1108 (Pine Street/Anderson Road)										
NC 11 - SR 1550/ SR 1546	0.20	22	N/A	2	11,500	1,200	1,900	ADQ	ADQ	3,400
SR 1109 (Earl Howard Road)										
SR 1103 - ECL Pink Hill	0.07	20	60	2	10,500	800	1,200	ADQ	ADQ	1,200
ECL Pink Hill - SR 1113	1.20	20	60	2	11,000	600	1,000	ADQ	ADQ	1,000
SR 1110 (H.C. Turner Road)										
Lenoir/ Duplin Co. Line - SR 1111	0.59	22	60	2	12,000	900	1,900	ADQ	ADQ	800
SR 1111 - NC 11	0.41	22	60	2	12,000	600	1,400	ADQ	ADQ	1,200

Appendix C

Thoroughfare Plan Street Tabulation and Recommendations

FACILITY & SECTION	EXISTING CROSS SECTION					AVG. DAILY TRAFFIC		RECOMMENDATIONS		
	DIST mi	RDWY ft	ROW ft	NO. OF LANES	PRACTICAL CAPACITY	1998	2025	RDWY X-SECT	PRACTICAL CAPACITY	2025 ADT
SR 1111 (Old Pink Hill Road)										
NC 11 - SR 1110	0.55	20	60	2	11,000	1,200	2,600	K	13,000	4,200
SR 1110 - SR 1163	0.35	20	60	2	11,000	700	1,600	K	13,000	1,600
SR 1113 (Ash Davis Road)										
EPB - SR 1109	0.32	20	60	2	11,000	700	1,300	ADQ	ADQ	1,300
SR 1109 - SR 1203	0.68	20	60	2	11,000	400	900	ADQ	ADQ	1,000
SR 1203 - NC 11	0.45	20	60	2	11,000	300	900	ADQ	ADQ	900
SR 1193 (Pinewood Home Drive)										
NC 11 - SR 1194	0.22	20	N/A	2	10,500	100	300	ADQ	ADQ	600
SR 1194 (Rosewood Drive)										
NC 11 - SR 1193/1203	0.15	18	N/A	2	8,500	50	200	ADQ	ADQ	200
SR 1203 (Pinewood Home Drive)										
SR 1194 - SR 1113	0.40	20	N/A	2	11,000	200	400	ADQ	ADQ	600
SR 1546 (Bill Sutton Road)										
SR 1547 - SR 1551	0.61	20	60	2	11,000	1,600	3,000	K	13,000	3,000
SR 1551 - SR 1550 / 1108	0.73	20	60	2	11,000	1,300	2,200	K	13,000	3,100
SR 1549 (Irrigation Pond Road)										
SR 1551 - SR 1550	0.93	20	N/A	2	11,000	100	400	ADQ	ADQ	300
SR 1550 - NC 11	0.47	20	N/A	2	11,000	100	500	ADQ	ADQ	500
SR 1550 (Lester Turner Road)										
SR 1549 - SR 1546/ 1108	0.47	20	N/A	2	4,000	50	100	ADQ	ADQ	100
SR 1551 (Burncoat Rd)										
WPB - SR 1546	0.30	20	60	2	11,000	200	500	ADQ	ADQ	400
SR 1546 - Lenoir/ Duplin Co. Line	0.15	20	60	2	11,000	900	1,900	ADQ	ADQ	800
SR 1704 (Kitty Noecker Road)										
SR 1705 - WPB	0.68	18	N/A	2	9,000	400	500	K	13,000	500
SR 1705 (Tapp Farm Road)										
SR 1704 - SPB	0.72	18	N/A	2	9,000	800	1,900	K	13,000	1,900
SR 1706 (Broadway Street)										
Lenoir/ Duplin Co. Line - NC 11	0.20	20	N/A	2	10,500	800	1,300	ADQ	ADQ	1,200

Appendix C

Thoroughfare Plan Street Tabulation and Recommendations

FACILITY & SECTION	EXISTING CROSS SECTION					AVG. DAILY TRAFFIC		RECOMMENDATIONS		
	DIST mi	RDWY ft	ROW ft	NO. OF LANES	PRACTICAL CAPACITY	1998	2025	RDWY X-SECT	PRACTICAL CAPACITY	2025 ADT
SR 1738 (Pink Hill Plant)										
SR 1705 - Lenoir/ Duplin Co. Line	0.11	18	N/A	2	9,000	200	400	ADQ	ADQ	400
Broadway Street										
SPB - Lenoir/ Duplin Co. Line	(Signed as SR 1103)									
Lenoir/ Duplin Co. Line - NC 11	(Signed as SR 1706)									
Carol Drive										
Front Street - NC 11	0.25	18	N/A	2	8,500	100	200	ADQ	ADQ	200
Central Avenue										
Lynnwood Ave. - Cherry Tree Branch	0.05	32	N/A	2	12,000	100	200	ADQ	ADQ	200
Cherry Tree Branch - NC 11	0.05	22	N/A	2	11,000	100	200	ADQ	ADQ	200
NC 11 - SR 1103	0.10	34	N/A	2	12,000	100	100	ADQ	ADQ	100
SR 1103 - Walnut Street	0.05	20	N/A	2	9,500	600	600	ADQ	ADQ	600
Walnut Street - New Street	0.25	22	N/A	2	11,000	300	600	ADQ	ADQ	600
Clay Street										
NC 241 - Turner Street	0.20	20	N/A	2	9,500	200	200	ADQ	ADQ	200
Front Street										
SPB - NC 11	(Signed as NC 241)									
NC 11 - Carol Drive	0.30	18	N/A	2	8,000	300	400	ADQ	ADQ	400
Jones Street										
SR 1103 - College St./ Old Beulaville Rd.	0.10	20	N/A	2	9,500	300	300	ADQ	ADQ	300
Lee Street										
Walnut Street - NC 11	0.05	18	N/A	2	8,000	100	100	ADQ	ADQ	100
Lynnwood Avenue										
NC 11 - Front Street	0.10	18	N/A	2	8,000	100	200	ADQ	ADQ	100
Front Street - Pine Street	0.15	32	N/A	2	12,000	200	500	ADQ	ADQ	300
Pine Street - SR 1108	0.05	18	N/A	2	8,000	200	400	ADQ	ADQ	400
Macon Street										
Turner Street - NC 241	0.30	18	N/A	2	8,000	600	800	ADQ	ADQ	800
New Street										
NC 11 - Duplin County	0.20	18	N/A	2	8,000	300	500	ADQ	ADQ	500

Appendix C

Thoroughfare Plan Street Tabulation and Recommendations

FACILITY & SECTION	EXISTING CROSS SECTION					AVG. DAILY TRAFFIC		RECOMMENDATIONS		
	DIST mi	RDWY ft	ROW ft	NO. OF LANES	PRACTICAL CAPACITY	1998	2025	RDWY X-SECT	PRACTICAL CAPACITY	2025 ADT
Old Beulaville Road										
Jones Street - NC 241	0.35	18	N/A	2	8,000	200	200	ADQ	ADQ	200
Pine Street										
Macon Street - Walnut Street	0.10	18	N/A	2	8,000	800	1,000	ADQ	ADQ	1,200
Walnut Street - SR 1103	0.05	36	N/A	2	12,000	900	1,200	ADQ	ADQ	1,400
SR 1103 - NC 11	0.10	20	N/A	2	9,500	2,200	3,300	ADQ	ADQ	3,900
Turner Street										
Lenoir/ Duplin Co. Line - SR 1103	(Signed as SR 1107)									
SR 1103 - NC 11	0.10	18	N/A	2	8,000	400	1,000	ADQ	ADQ	1,000
Walnut Street										
NC 241 - Central Avenue	0.05	26	N/A	2	12,000	500	500	ADQ	ADQ	500
Central Avenue - Pine Street	0.05	38	N/A	2	12,000	500	500	ADQ	ADQ	500
Pine Street - Lee Street	0.10	18	N/A	2	8,000	500	500	ADQ	ADQ	500

Appendix D
Typical Thoroughfare Cross Sections

Cross section requirements for thoroughfares vary according to the capacity and level of service to be provided. Universal standards in the design of thoroughfares are not practical. Each roadway section must be individually analyzed and its cross section determined based on the volume and type of projected traffic, existing capacity, desired level of service, and available right of way. Based on these criteria, recommended typical cross sections are given in Appendix C. These cross sections are typical for facilities on new location and where right of way constraints are not critical. For widening projects and urban projects with limited right of way, special cross sections should be developed that meet the needs of the project.

On all existing and proposed major thoroughfares delineated on the thoroughfare plan, adequate right of way should be protected or acquired for the recommended cross sections. In addition to cross section and right of way recommendations for improvements, Appendix C may recommend ultimate needed right of way for the following situations:

- thoroughfares which may require widening after the current planning period,
- thoroughfares which are borderline adequate and accelerated traffic growth could render them deficient, and
- thoroughfares where an urban curb and gutter cross section may be locally desirable because of urban development or redevelopment.

Recommended design standards relating to grades, sight distances, degree of curve, superelevation, and other considerations for thoroughfares are given in Appendix E. The typical cross sections are described below and are shown in Figure D-1.

A: Four Lanes Divided with Median - Freeway

Cross section "A" is typical for four-lane divided highways in rural areas which may have only partial or no control of access. The minimum median width for this cross section is 46 feet, but a wider median is desirable.

B: Seven Lanes - Curb & Gutter

Cross section "B" is typically not recommended for new projects. When the conditions warrant six lanes, cross section "D" should be recommended. Cross section "B" should be used only in special situations such as when widening from a five-lane section where right of way is limited. Even in these situations, consideration should be given to converting the center turn lane to a median so that cross section "D" is the final cross section.

C: Five Lanes - Curb & Gutter

Typical for major thoroughfares, cross section "C" is desirable where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

D: Six Lanes Divided with Raised Median - Curb & Gutter; E - Four Lanes Divided with Raised Median - Curb and Gutter

Cross sections "D" and "E" are typically used on major thoroughfares where left turns and intersection streets are not as frequent. Left turns would be restricted to a few selected intersections. The 16-ft median is the minimum recommended for an urban boulevard-type cross section. In most instances, monolithic construction should be utilized due to greater cost effectiveness, ease and speed of placement, and reduced future maintenance requirements. In certain cases, grass or landscaped medians result in greatly increased maintenance costs and an increase danger to maintenance personnel. Non-monolithic medians should only be recommended when the above concerns are addressed.

F: Four Lanes Divided - Boulevard, Grass Median

Cross section "F" is typically recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 24 ft is recommended, with 30 ft being desirable.

G: Four Lanes - Curb & Gutter

Cross section "G" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right of way is restricted. An additional left turn lane would likely be required at major intersections. This cross section should be used only if the above criteria are met. If right of way is not restricted, future strip development could take place and the inner lanes could become de facto left turn lanes.

H: Three Lanes - Curb & Gutter

In urban environments, thoroughfares that are proposed to function as one-way traffic carriers would typically require cross section "H".

I: Two Lanes - C&G, Parking both sides; J - Two Lanes - C&G, Parking one side

Cross section "I" and "J" are usually recommended for urban minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "I" would be used on those minor thoroughfares where parking on both sides is needed as a result of more intense development.

K: Two Lanes - Paved Shoulder

Cross section "K" is used in rural areas or for staged construction of a wider multi-lane cross section. On some thoroughfares, projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time. For areas that are growing and future widening will be necessary, the full right of way of 100 ft should be required. In some instances, local ordinances may not allow the full 100 ft. In those cases, 70 ft should be preserved with the understanding that the full 70 ft will be preserved by use of building setbacks and future street line ordinances.

L: Six Lanes Divided with Grass Median - Freeway

Cross section "L" is typical for controlled access freeways. The 46-ft grass median is the minimum desirable width, but variation from this may be permissible depending upon design considerations. Right of way requirements are typically 228 ft or greater, depending upon cut and fill requirements.

M: Eight Lanes Divided with Raised Median - Curb & Gutter

Also used for controlled access freeways, cross section "M" may be recommended for freeways going through major urban areas or for routes projected to carry very high volumes of traffic.

N: Five Lanes with C&G, Widened Curb Lanes; O: Two Lane/Shoulder Section; P: Four Lanes Divided with Raised Median - C&G, Widened Curb Lanes

If there is sufficient bicycle travel along the thoroughfare to justify a bicycle lane or bikeway, additional right of way may be required to contain the bicycle facilities. The North Carolina Bicycle Facilities Planning and Design Guidelines should be consulted for design standards for bicycle facilities. Cross sections "N", "O", and "P" are typically used to accommodate bicycle travel.

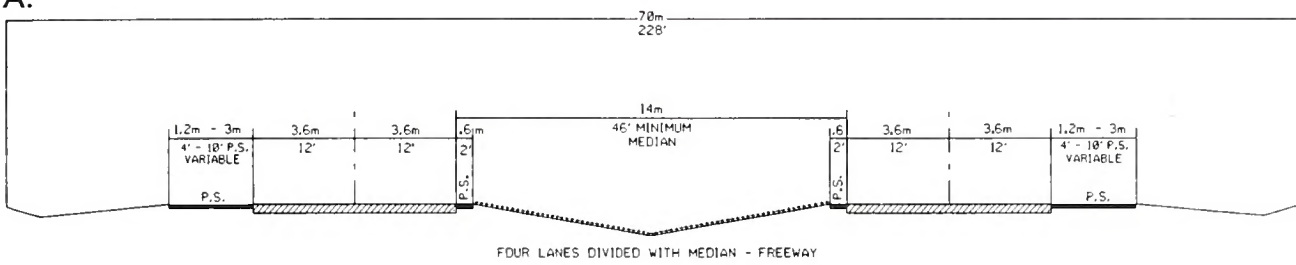
General

The urban curb and gutter cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right of way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk farther away from the street to provide additional separation for pedestrians or for aesthetic reasons, additional right of way must be provided to insure adequate setback for utility poles.

The right of way shown for each typical cross section is the minimum amount required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right of way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

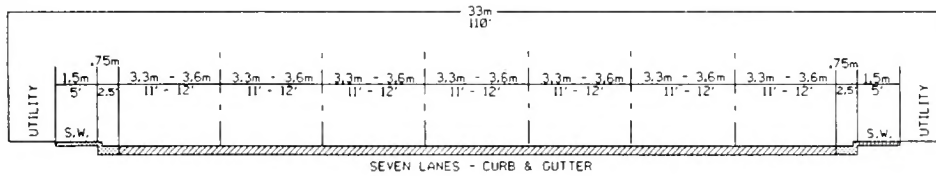
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



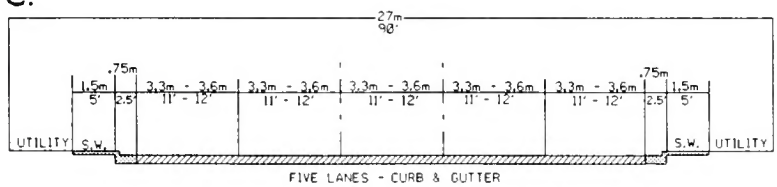
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

B.



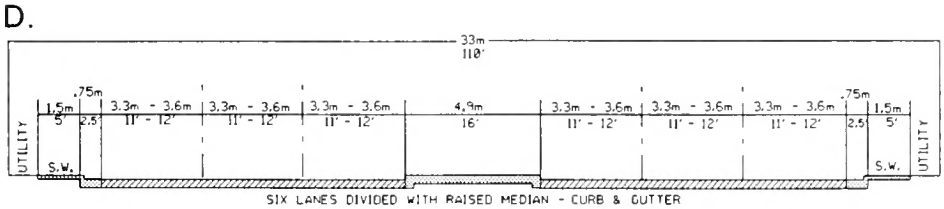
SEVEN LANES - CURB & GUTTER

C.



FIVE LANES - CURB & GUTTER

D.

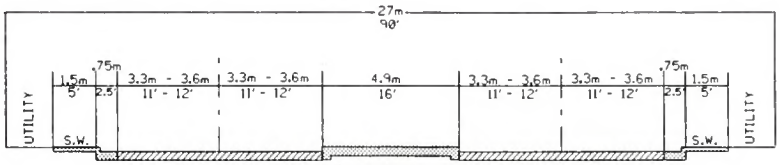


SIX LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

FIGURE D-1

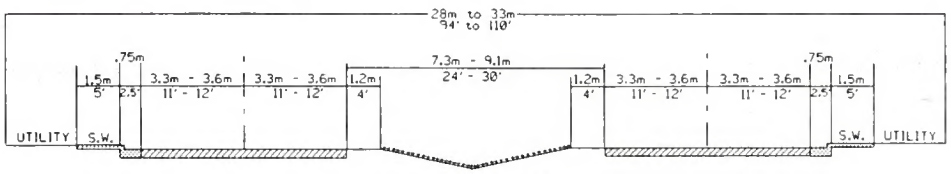
TYPICAL THOROUGHFARE CROSS SECTIONS

E.



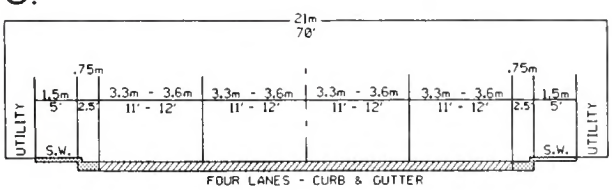
FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

F.



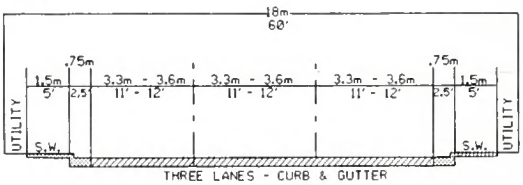
FOUR LANES DIVIDED - BOULEVARD
GRASS MEDIAN

G.



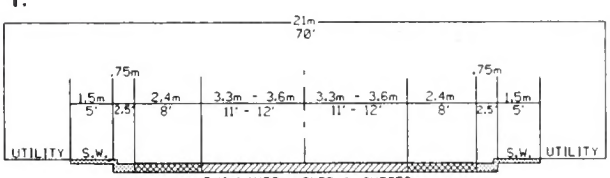
FOUR LANES - CURB & GUTTER

H.



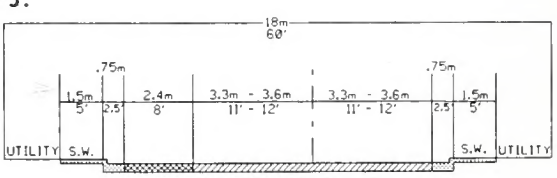
THREE LANES - CURB & GUTTER

I.



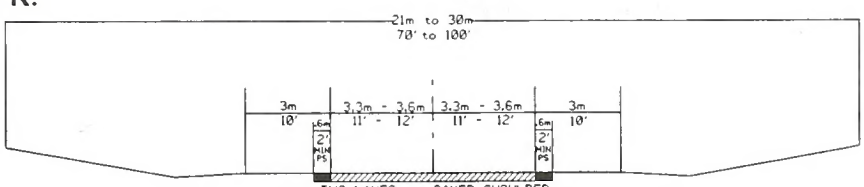
TWO LANES - CURB & GUTTER
PARKING ON EACH SIDE

J.



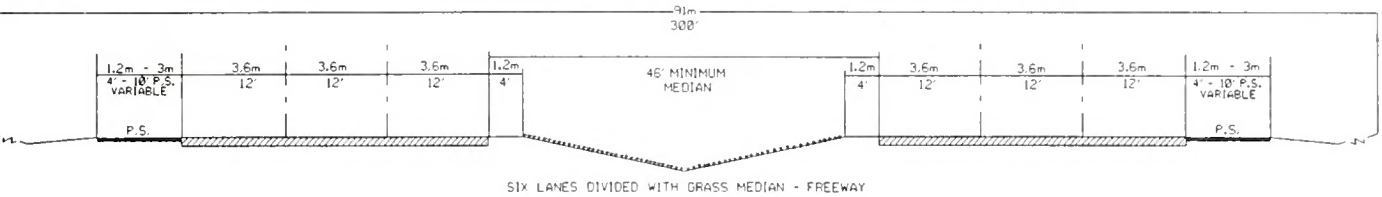
TWO LANES - CURB & GUTTER
PARKING ON ONE SIDE

K.



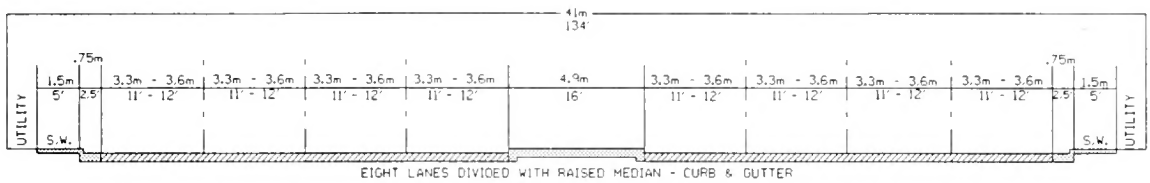
TWO LANES - PAVED SHOULDER

TYPICAL THOROUGHFARE CROSS SECTIONS



SIX LANES DIVIDED WITH GRASS MEDIAN - FREEWAY

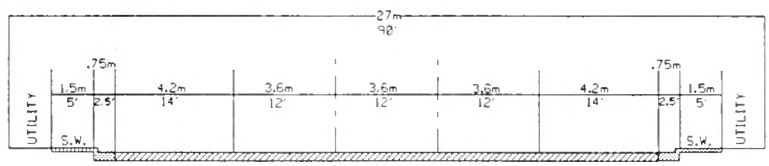
M.



EIGHT LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

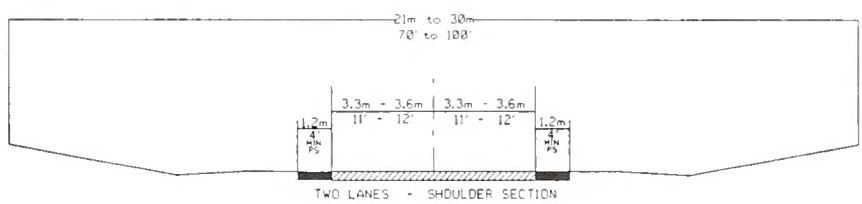
TYPICAL THOROUGHFARE CROSS SECTIONS FOR ACCOMMODATING BICYCLES

N.



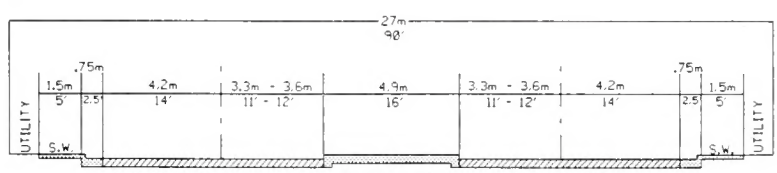
FIVE-LANE ROADWAY WITH CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

O.



TWO LANES - SHOULDER SECTION

P.



FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

Appendix E
Recommended Subdivision Ordinances

Definitions

Streets and Roads

Rural Roads

- ***Principal Arterial*** - A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic; consists of interstate routes and other routes designated as principal arterials.

- ***Minor Arterial*** - A rural roadway joining cities and larger towns and providing intrastate and intercounty service at relatively high overall travel speeds with minimum interference to through movement.

- ***Major Collector*** - A road that serves major intracounty travel corridors and traffic generators and provides access to the arterial system.

- ***Minor Collector*** - A road that provides service to small local communities and traffic generators and provides access to the major collector system.

- ***Local Road*** - A road that serves primarily to provide access to adjacent land, over relatively short distances.

Urban Streets

- ***Major Thoroughfares*** - Major thoroughfares consist of interstate, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.

- ***Minor Thoroughfares*** - Minor thoroughfares perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through traffic movements and also serve abutting property.

- ***Local Street*** - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

Specific Type Rural or Urban Streets

- ***Freeway, expressway, or parkway*** - Divided multilane roadways designed to carry large volumes of traffic at high speeds. A *freeway* provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. An *expressway* is a facility with full or partial control of access and generally

with grade separations at major intersections. A *parkway* is for non-commercial traffic, with full or partial control of access.

- ***Residential Collector Street*** - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.

- ***Local Residential Street*** - Cul-de-sacs, loop streets less than 2500 feet in length, or streets less than 1.0 miles in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.

- ***Cul-de-sac*** - A short street having only one end open to traffic and the other end being permanently terminated with a vehicular turn-around provided.

- ***Frontage Road*** - A road that parallels a partial or full controlled-access facility which provides access to adjacent land.

- *Alley* - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the backside of properties otherwise abutting on a street.

Property

- **Building Setback Line** - A line parallel to the street in front of which no structure shall be erected.

- **Easement** - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

- **Lot** - A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership and/or for development. The word "lot" includes the words "plat" and "parcel".

Subdivision

- **Subdivider** - Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.

- **Subdivision** - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets.

  The following shall not be included within this definition nor subject to these regulations:

  * the combination or re-combination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein,
  * the division of land into parcels greater then 10 acres where no street right of way dedication is involved,

* the public acquisition, by purchase, of strips of land for the widening or the opening of streets, and
* the division of a tract in single ownership whose entire area is no greater than 2 acres into not more than three lots, where no street right of way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

- **Dedication -** A gift, by the owner, of his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.

- **Reservation -** Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

Roadway Design Standards

The design of all roads within a planning area shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHTO) manuals.

The provision of right of way for roads shall conform and meet the recommendations of the thoroughfare plan, as adopted by the municipality or county. The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally, the proposed streets should be the extension of existing streets, where possible.

Right of Way Widths

Right of way (ROW) widths shall not be less than the minimum standards given in Table E-1 and shall apply except in those cases where ROW requirements have been specifically set out in the thoroughfare plan.

The subdivider will only be required to dedicate a maximum of 100 feet of ROW. In cases where over 100 feet of right of way is desired, the subdivider will be required only to reserve the amount in excess of 100 feet. In all cases in which ROW is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width ROW, not less then 60 feet in width, may be dedicated when adjoining undeveloped property is owned or controlled by the subdivider, provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is sub-divided, the remainder of the full required right of way shall be dedicated.

Table E-1

Minimum Right of way Requirements

Area Classification	Functional Classification	Minimum ROW
RURAL	Principle Arterial	Freeways- 350 ft Other- 200 ft
	Minor Arterial	100 ft
	Major Collector	100 ft
	Minor Collector	80 ft
	Local Road	60 ft[1]
URBAN	Major Thoroughfare	90 ft
	Minor Thoroughfare	70 ft
	Local Street	60 ft [1]
	Cul-de-sac	variable[2]

[1]The desirable minimum ROW is 60 ft. If curb and gutter is provided, 50 ft of ROW is adequate on local residential streets.

[2]The ROW dimension will depend on radius used for vehicular turn around. Distance from edge of pavement of turn around to ROW should not be less than distance from edge of pavement to ROW on street approaching turn around.

Street Widths

Widths for street and road classifications other than local shall be as recommended by the thoroughfare plan. Width of local roads and streets shall be as follows:

- ***Local Residential***
    - * Curb and Gutter section: 26 feet, face to face of curb
    - * Shoulder section: 20 feet to edge of pavement, 4 feet for shoulders

- ***Residential Collector***
    - * Curb and Gutter section: 34 feet, face to face of curb
    - * Shoulder section: 20 feet to edge of pavement, 6 feet for shoulders

Geometric Characteristics

The standards outlined below shall apply to all subdivision streets proposed for addition to the state highway system or municipal street system. In cases where subdivision is sought adjacent to a

proposed thoroughfare corridor, the requirements of dedication and reservation discussed under the 'Right of Way Widths' section shall apply.

- ***Design Speed*** - The design speed for a roadway should be a minimum of 5 mph greater than the posted speed limit. The design speeds for subdivision type streets are shown in Table E-2.

- ***Minimum Sight Distance*** - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provided and calculated using the parameters set forth in Table E-3.

- ***Superelevation*** - Table E-4 shows the minimum radius and the related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

- ***Maximum and Minimum Grades*** - The maximum percent grades are shown in Table E-5. Minimum grade should not be less then 0.5%. Grades for 100 feet each way from intersections (measured from edge of pavement) should not exceed 5%.

Table E-2

Design Speeds

Facility Type	Design Speed (mph) Desirable	Minimum Level	Rolling
RURAL			
Minor Collector Roads (ADT Over 2000)	60	50	40
Local Roads[1] (ADT Over 400)	50	*50	*40
URBAN			
Major Thoroughfares[2]	60	50	40
Minor Thoroughfares	40	30	30
Local Streets	30	**30	**20

Note: *Based on ADT of 400-750. Where roads serve a limited area and small number of units, can reduce minimum design speed. **Based on projected ADT of 50-250. (Reference NCDOT Roadway Design Manual page 1-1B)

[1]Local Roads including Residential Collectors and Local Residential.

[2]Major Thoroughfares other than Freeways or Expressways.

Table E-3

Sight Distance

Design Speed (mph)	Stopping Sight Distance (feet)		Minimum K[1] Values (feet)		Passing Sight Distance (feet)
	Desirable	Minimum	Crest Curve	Sag Curve	For 2-lanes
30	200	200	30	40	1100
40	325	275	60	60	1500
50	475	400	110	90	1800
60	650	525	190	120	2100

Note: General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case. (Reference NCDOT Roadway Design Manual page 1-12 T-1)

[1]K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length of the vertical curve which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1990".

Table E-4

Superelevation

Design Speed (mph)	Minimum Radius of Maximum e[1]			Maximum Degree of Curve		
	e=0.04	e=0.06	e=0.08	e=0.04	e=0.06	e=0.08
30	302	273	260	19 00'	21 00'	22 45'
60	573	521	477	10 00'	11 15'	12 15'
80	955	955	819	6 00'	6 45'	7 30'
100	1,637	1,432	1,146	3 45'	4 15'	4 45'

[1]e = rate of roadway superelevation, foot per foot

Note: (Reference NCDOT Roadway Design Manual page 1-12 T-6 thru T-8)

Table E-5

Maximum Vertical Grade

Facility Type and Design Speed (km/h)	Minimum Grade in Percent		
	Flat	Rolling	Mountainous
RURAL			
Minor Collector Roads*			
20	7	10	12
30	7	9	10
40	7	8	10
50	6	7	9
60	5	6	8
70	4	5	6
Local Roads*[1]			
20	-	11	16
30	7	10	14
40	7	9	12
50	6	8	10
60	5	6	-
URBAN			
Major Thoroughfares[2]			
30	8	9	11
40	7	8	10
50	6	7	9
60	5	6	8
Minor Thoroughfares*			
20	9	12	14
30	9	11	12
40	9	10	12
50	7	8	10
60	6	7	9
70	5	6	7
Local Streets*			
20	-	11	16
30	7	10	14
40	7	9	12
50	6	8	10
60	5	6	-

Note: *For streets and roads with projected annual average daily traffic less than 250 or short grades less than 150 meters (500 ft) long, grades may be 2% steeper than the values in the above table. (Reference NCDOT Roadway Metric Design Manual page 1-12 T-3)

[1]Local Roads including Residential Collectors and Local Residential.

[2]Major Thoroughfares other than Freeways or Expressways.

Intersections

Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty-five (65) degrees.

Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

Offset intersections are to be avoided. Intersections that cannot be aligned should be separated by a minimum length of 200 feet between survey centerlines.

Cul-de-sacs

Cul-de-sacs shall not be more than one hundred and fifty 500 feet in length. The distance from the edge of pavement on the vehicular turn around to the right of way line should not be less than the distance from the edge of pavement to right of way line on the street approaching the turn around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

Alleys

Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provisions are mode for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances. The width of an alley shall be at least 20 feet.

Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn around facilities as may be required by the planning board.

Permits for Connection to State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at NCDOT's District Offices.

Offsets for Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 30 feet from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 6 feet from the face of curb.

Wheel Chair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

Horizontal Width on Bridge Deck

The clear roadway width standards for new and reconstructed bridges serving two-lane, two-way traffic are given below.

- shoulder section approach
    * under 800 ADT design year - minimum 28 feet width face to face of parapets, rails, or pavement width plus 10 feet, whichever is greater
    * 800 - 2000 ADT design year - minimum 34 feet width face to face of parapets, rails, or pavement width plus 12 feet, whichever is greater
    * over 2000 ADT design year - minimum width of 40 feet, desirable width of 44 feet width face to face of parapets or rails

- curb and gutter approach
    * under 800 ADT design year - minimum 24 feet face to face of curbs
    * over 800 ADT design year - width of approach pavement measured face to face of curbs
    * where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face curbs, and in crown drop; the distance from face of curb to face of parapet or rail shall be a minimum of 1.5 feet, or greater if sidewalks are required

The clear roadway width standards for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic are given below.

- shoulder section approach - width of approach pavement plus width of usable shoulders on the approach left and right shoulder width 8 feet minimum, 10 feet desirable
- curb and gutter approach - width of approach pavement measured face to face of curbs

Appendix F
Transportation Improvement Program
Project Request Process

The process for requesting projects to be included in the Transportation Improvement Program (TIP) is described briefly in this appendix.

Local representatives should first decide which projects from the thoroughfare plan they want funded in the TIP. A TIP request for a few carefully selected projects is likely to be more effective than requesting all the projects proposed in the thoroughfare plan. The projects being requested should also be prioritized by the local representatives.

After determining which projects are the highest priority for the area, a TIP project request should be sent to the Board of Transportation Member from the municipality's respective district. The TIP project request should include a letter with a prioritized summary of requested projects, as well as a TIP candidate project request form and a project location map for each project. An example of each of these items is included in this appendix.

Example

* *Note: This is not an official request submitted to the Board of Transportation. This is intended to be an example of a Transportation Improvement Program (TIP) Request.*

Month ##, Year

North Carolina Board Member
N. C. Board of Transportation
N. C. Department of Transportation
P. O. Box 25201
Raleigh, NC 27611-5201

Dear Board Member:

SUBJECT: 1998-2004 TIP Project Requests for *Generic Town*

Enclosed find the projects requested by *Generic Town* for consideration in the next TIP update. The list is presented by priority, as approved by the *Generic Town Commissioners* at their *Month* meeting.

Generic Town also endorsed the existing schedule of projects contained in the current TIP for the town, with one request. The town requests that TIP Project R-*XXXX* remain as a high priority and kept on the existing schedule.

We thank you for the opportunity to participate in development of the state TIP. Please contact us immediately if addition information is needed concerning any of the enclosed project requests.

Sincerely,

John Q. Public

cc: Division Engineer
Enclosure

Generic Town

Town Commissioners

1998 Proposed Highway Projects (Final)

1) **SR 1111 (Town Street) & SR 1112 (Industry Drive) TIP Project R-XXXX**
   - From SR 1113 (Country Road) to NC 12
   - Widen roadway to a multilane facility, with some new location

2) **US 11**
   - From SR 1112 (Industry Drive) to SR 1113 (Country Road)
   - Widen roadway to a multilane facility

3) **NC 12**
   - From SR 1114 (Any Road) to the existing four lane section just south of I-85
   - Widen roadway to a multilane facility

4) **US 11 Business (Business Road)**
   - From SR 1115 (Some Road) to NC 12
   - Widen facility to a five lane cross section

5) **New Connector**
   - From US 11 to US 112 Business (City Street)
   - New Facility

Highway Program
TIP Candidate Project Request

(Please Provide Information if Available)

Date ##/##/## Priority No. #

Town *Generic* City/Town

Requesting Agency *Town Commissioners* NCTIP No. *R-####* (if available)

Route (US, NC, SR/Local Name) *SR 1111(Town Street) and SR 1112(Industry Drive)*

Project Location (From/To/Length) *From SR 1113 (Country Road) to NC 12, ## miles*

Type of Project (Widening, New Facility, Bridge Replacement, Signing, Safety, Rail Crossing, Bicycle, Enhancement, etc.)
Widen roadway to a multi-lane facility, with some new location.

Existing Cross Section *24* Feet, Type

Existing Row *60 to 80* Feet Existing ADT *8,000 (1996)*

Estimated Cost, ROW $ *900,000* Construction $ *4,000,000*

Brief Justification for Project *As a major thoroughfare, this facility carries increasing traffic volumes between the industial sites along this route to NC 12 and the I-85 corridor. In the adopted thoroughfare plan for Generic Town, it is recommended that this facility should be widen to a multi-lane cross section due to the increasing volume and the potential for more development in this area. The Town requests that this project continue to be funded.*

Project Supported By (Agency/Group)

Other Information/ Justification

- ☒ Part of Thoroughfare Plan
- ☐ Part of Comprehensive Plan
- ☐ Serves School
- ☐ Serves Hospital
- ☐ Obsolete Facility
- ☐ Serves Park
- ☐ High Accident (#)
- ☐

(Please attach to the request a map showing the project location.)

Appendix G
Index for Secondary Road Numbers

Lenoir County

- SR 1103 - Potters Hill Road
- SR 1105 - Pleasant Hill Road
- SR 1107 - Turner Street
- SR 1108 - Anderson Rd./ Pine St.
- SR 1109 - Earl Howard Road
- SR 1110 - H.C. Turner Road
- SR 1111 - Old Pink Hill Road
- SR 1113 - Ash Davis Road
- SR 1163 - Duplin county Road
- SR 1173 - Leighton Drive
- SR 1174 - Azalea Avenue
- SR 1193/1203 - Pinewood Home Dr.
- SR 1194 - Rosewood Drive
- SR 1202 - Central Avenue

Duplin County

- SR 1546 - Bill Sutton Road
- SR 1547 - Grady Smith Road
- SR 1549 - Irrigation Pond Road
- SR 1550 - Lester Turner
- SR 1551 - Burncoat Road
- SR 1704 - Kitty Noecker Road
- SR 1705 - Tapp Farm Road
- SR 1706 - Broadway Street
- SR 1738 - Pink Hill Plant